APPENDIX TO THE REPORT OF THE MINISTER OF AGRICULTURE

EXPERIMENTAL FARMS

REPORTS

OF THE

DIRECTOR		WM. SAUNDERS.
AGRICULTURIST		JAS. W. ROBERTSON.
HORTICULTURIST		JOHN CRAIG.
CHEMIST		F. T. SHUTT, M.A.
ENTOMOLOGIST and BOTANIST		JAS. FLETCHER.
POULTRY MANAGER		A. G. GILBERT.
SUPT. EXPERIMENTAL FARM,	Nappan, N.S.	WM. M. BLAIR.
do do	Brandon, Manitoba.	S. A. BEDFORD.
do do	Indian Head, N.-W.T.	ANGUS MACKAY.
do do	Agassiz, B.C.	THOS. A. SHARPE.

FOR

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APPENDIX

TO THE

REPORT OF THE MINISTER OF AGRICULTURE

ON

EXPERIMENTAL FARMS.

OTTAWA, 20th March, 1892.

SIR,—I have the honour to submit for your approval my fifth annual report of the work done and in progress at the several experimental farms, which have, under your instruction, been established in different parts of the Dominion.

You will also find appended reports from the following officers of the Central Experimental Farm: From the Agriculturist, Mr. James W. Robertson; from the Horticulturist, Mr. John Craig; from the Chemist, Mr. Frank T. Shutt, and from the Entomologist and Botanist, Mr. James Fletcher. A report is also submitted from the Poultry Manager, Mr. A. G. Gilbert.

From the branch experimental farms there are reports from Mr. Wm. M. Blair, superintendent of the experimental farm for the Maritime Provinces, at Nappan, Nova Scotia; from Mr. S. A. Bedford, superintendent of the experimental farm for Manitoba, at Brandon; from Mr. Angus Mackay, superintendent of the experimental farm for the North-West Territories, at Indian Head; and from Mr. Thos. A. Sharpe, superintendent of the experimental farm for British Columbia, at Agassiz.

These reports will be found to cover experimental work and carefully conducted observations in almost every department of agriculture and horticulture. They also contain much information relating to those branches of chemical work which have a direct bearing on agriculture, and to those departments of entomology and botany which are of practical importance to the farmers of this country.

It is hoped that the facts submitted, and the results of the experimental work recorded in this report, may be helpful to all those engaged in cultivating the soil, and that they may thus aid in furthering the agricultural and horticultural interests of the Dominion.

I have the honour to be, Sir,

Your obedient servant,

WM. SAUNDERS.

The Honourable
The Minister of Agriculture,
Ottawa.

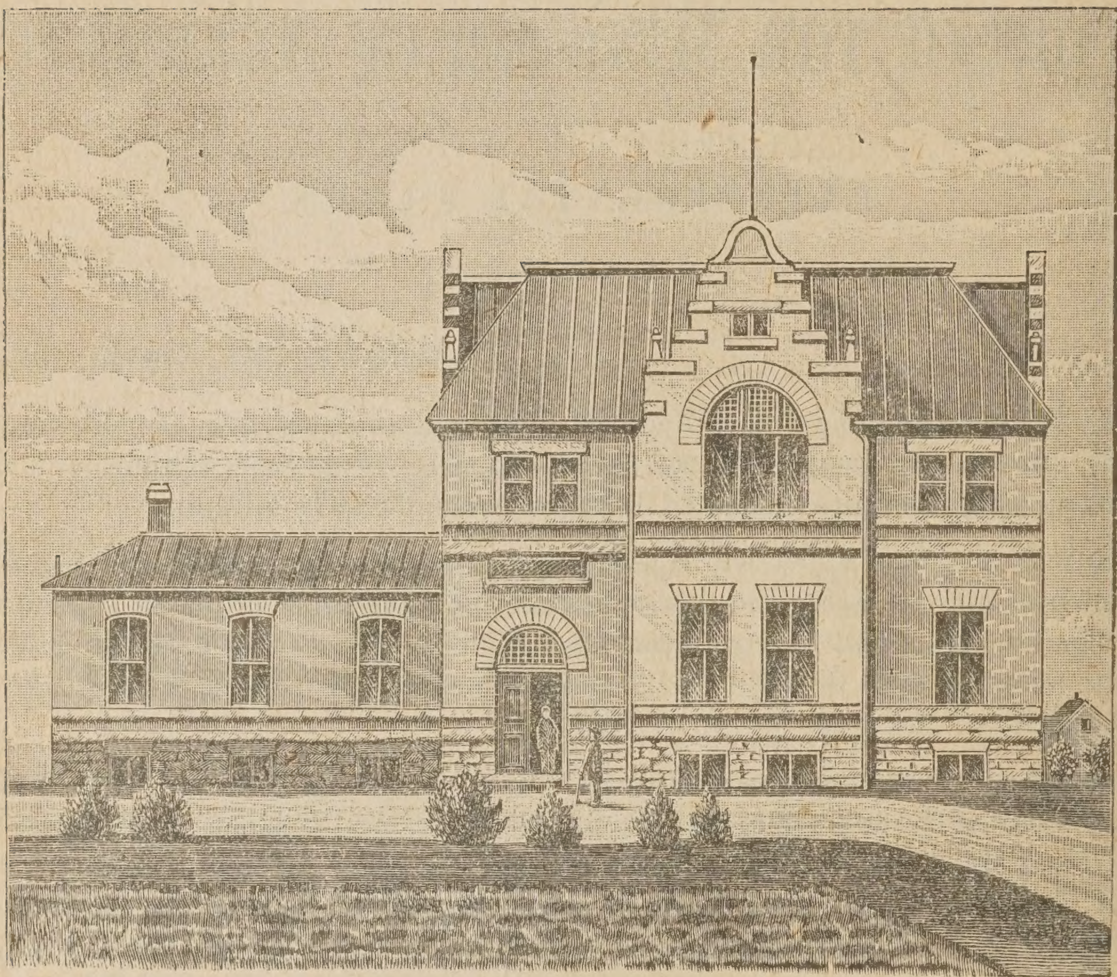

Figure 1.—Office Building, Museum and Chemical Laboratory of the Central Experimental Farm.

ANNUAL REPORT

ON THE

EXPERIMENTAL FARMS.

REPORT OF THE DIRECTOR.

During the season of 1891 farmers in almost every part of the Dominion of Canada have been blessed with bountiful crops. With few exceptions favourable weather for seeding, growth and harvesting has prevailed from the Atlantic to the Pacific, and the results have been such as to provoke a general spirit of thankfulness among those engaged in agricultural pursuits. Compared with the average of the past nine years, the statistics of Ontario show an increase for the past year in that province in fall wheat of 5·7 bushels per acre; in spring wheat, 5·4 bushels; barley, 3·2; oats, 5·7; peas, 3·6, and of corn in the ear of 9·8 bushels per acre. In turnips the crop has been increased above the average for the period named by 136 bushels per acre; mangels, 76 bushels; carrots, 36 bushels; and potatoes, 28·9 bushels, the only items where there has been any falling off being in beans and hay. The former is less than the average by 1·3 bushels per acre, and the latter by about four-tenths of a ton per acre. This last has no doubt been due to the very dry weather which prevailed generally during the month of June. Farmers have also had favourable results in the Maritime Provinces. In Manitoba and the North-West Territories, notwithstanding the strong winds which prevailed in the spring and the early frosts in autumn, the returns on the whole have been most bountiful. The stores of fertility laid up by nature with so liberal a hand in the soil of those fertile plains promise food and plenty in the future to in-coming multitudes. In British Columbia also almost every sort of crop is said to have been above the average. The outlook from an agricultural standpoint is most encouraging for Canada, for it will be found that associated with the favourable season there have been improvements in the preparation of the soil, in the selection of the seed and in the general management of the crops, showing that increased intelligence is being brought to bear on farm work. The stores of fertility in the soil are being more carefully husbanded by a judicious succession of crops, and greater pains are taken to replace the elements which repeated cropping has removed. The mental inactivity of the past is fast being replaced by a spirit of enquiry which augurs well for the future.

That much may still be done by the farmer to improve his condition and add to his profits will scarcely admit of a doubt, and while there are some conditions which affect his crops which are beyond his control, the intelligent application of improved methods will enable him to make the very best of every favourable circumstance which may arise. One of the most important means of improvement within his reach is the selection of good seed, and it is worth while to pause to consider how much may be involved in this one point, hitherto so often neglected. Every seed has an individuality of its own impressed on it by nature, which, under favouring conditions, will manifest itself. Each is provided with a germ wherein lies this impress of individuality, and this germ is imbedded in a store of such food as is best suited to stimulate the growth of the young plant. When the seed is plump that food supply is bountiful, and the infant plant so nourished makes rapid head-

way, but where the seed is shrunken and imperfectly developed the store of nourishment is much lessened. After the young plant has begun to grow a period of comparative rest is needed, during which growth above is scarcely perceptible, until the roots are sufficiently extended to gather food for further development; the rapidity with which this progress is made depends very much on the plumpness and inherent vigour of the seed. Crops are thus often enfeebled at the start and delayed in ripening by the use of poor seed, or they ripen unevenly and lack that vigour so necessary to a liberal return.

As an illustration we may take the oat crop. How often it has occurred that farmers have held over for seed such oats as were too poor in quality to sell to advantage, thinking that any sort was good enough for this purpose, and how frequently has the yield been poor and the grain of light weight. It is not unusual for good farmers who provide good seed of fertile sorts to have crops of this grain of from 50 to 60 bushels per acre, while the average is about 35 bushels; by the exercise of greater care in this respect the average production may be materially increased, and every additional bushel per acre would in Ontario alone add to the returns of the farming community nearly $625,000 a year. Or, taking the improvement in another line, it is well known that some farmers by the selection of good plump seed and thorough preparation of the soil grow oats from four to eight pounds heavier per bushel than many of their neighbours. It should not be forgotten that with an equal yield in measured bushels per acre an average increase in the single province of Ontario of one pound per bushel in weight in the entire crop would be a gain to the farmers, basing the estimate on the crop of last year, of $750,000 per annum. An addition of one bushel per acre on the wheat crop of Ontario, including both fall and spring wheat, would in like manner add to the gains of the farmers over $1,300,000 in a single season. These statements respecting wheat and oats will apply with more or less force to every other crop.

Good varieties of grain sometimes deteriorate by long and careless cultivation to such an extent as to make them unprofitable, when they are usually replaced by other sorts. Judicious selection and change of seed would no doubt conserve this fertility and add greatly to the length of life of such varieties. New sorts are obtained either by careful selection and cultivation, by the preservation of occasional sports which occur in nature or by artificial crossing. The watchful farmer may do much to improve his own grain, and furnish good seed to his less thoughtful neighbours by the first method, and occasionally secure new varieties by the second, but the third requires much more skill and care and is usually practised only by the expert in such matters. On the experimental farms all these methods are in operation, and in a very few years a large number of new sorts which have been originated in this climate will be available for test in different parts of the Dominion.

DISTRIBUTION OF SEED GRAIN.

In view of the importance of placing within the reach of Canadian farmers the best varieties of seed grain obtainable, all the most promising sorts are yearly brought together and tested at the experimental farms. The crops of such sorts as are likely to be generally useful are preserved, and under instruction of the Minister of Agriculture distributed the following season to those who apply for them as long as the supply lasts. The character of this free distribution is sometimes misunderstood. Some farmers think they have the right to demand samples of the seed of every sort of grain and crop grown on the farm, and lists are often received covering several pages of a letter enumerating all sorts of grain, vegetable seeds, bulbs, flowers, &c., which they desire to have sent them; others, again, will ask for seed sufficient for from 10 to 50 acres of land. It is not intended that this branch of the work of the experimental farms should in any way interfere with the business of the seedsmen, but to limit the distribution mainly to such varieties of seed grain as are not easily obtainable in the ordinary channels of commerce. The weight of each sample is limited to three pounds, and the number sent to each farmer is usually two or at most three, so that the supply available may be made to cover every year a large area in the country.

The samples sent out in the early months of 1891 were distributed as follows:—

Prince Edward Island.

Oats	107
Barley	50
Wheat	64
Peas	18
Indian corn	225
Potatoes	4
	468

Number of applicants supplied, 256.

Nova Scotia.

Oats	343
Barley	285
Wheat	300
Peas	63
Indian corn	695
Spring rye	27
Potatoes	31
	1,744

Number of applicants supplied, 1,000.

New Brunswick.

Oats	174
Barley	51
Wheat	88
Peas	55
Potatoes	1
	369

Number of applicants supplied, 244.

Quebec.

Oats	1,380
Barley	960
Wheat	296
Peas	280
Spring rye	109
Potatoes	89
Indian corn	2
	3,116

Number of applicants supplied, 1,205.

Ontario.

Oats	1,880
Spring wheat	950
Barley	860
Peas	440
Spring rye	4
Indian corn	10
Potatoes	105
	4,249

Number of applicants supplied, 1,575.

Manitoba.

Oats	468
Wheat	251
Barley	159
Peas	154
Indian corn	21
Potatoes	2
	1,055

Number of applicants supplied, 406.

North-West Territories.

Oats	267
Barley	260
Wheat	210
Peas	149
Indian corn	6
Potatoes	3
	895

Number of applicants supplied, 313.

British Columbia.

Oats	109
Barley	179
Wheat	62
Peas	30
Spring rye	9
Potatoes	1
	390

Number of applicants supplied, 141.

The following list shows the number of 3-lb. packages of the different varieties which have been distributed :—

Oats.

Prize Cluster	2,801
Victoria Prize	540
Flying Scotchman	531
Bonanza	383
Banner	378
American Triumph	71
Egyptian	24
Total	4,728

Barley—Two-rowed.

Carter's Prize Prolific	801
Danish Chevalier	650
Golden Melon	399
Webb's Kinver Chevalier	359
Carter's Goldthorpe	275
Saale	190
Beardless	46
Large Two-rowed Naked	20
Total	2,740

Barley—Six-rowed.

Baxter's Six-rowed	40
Indian from Spiti valley	24
Total	64

Spring Wheat.

Campbell's White Chaff	988
Ladoga	956
Red Fife	268
Johnston's Defiance	9
Total	2,221

Peas.

Multiplier	1,189

Indian Corn.

Pearce's Prolific Red Cob Ensilage Canada Yellow	885
Thoroughbred White Flint	74
Total	959

Rye.

Spring rye	149

Potatoes.

Chicago Market	96
Early Ohio	70
Early Sunrise	68
Rural Blush	1
Total	235

Total number of samples distributed, 12,285.

Number of applicants supplied, 5,140.

REPORTS RECEIVED FROM SAMPLES DISTRIBUTED, WITH SOME RESULTS OF FIELD CROPS.

PRIZE CLUSTER OATS.

This variety of oats has again given good returns. At the Central Experimental Farm the yield has varied on different soils from 84 bushels and 4 lbs. to 28 bushels 28 lbs., weighing about 42 lbs. per bushel. A large field averaged 48 bushels 24 lbs., and it was considered that one-fourth of the grain was beaten out by a hail storm, which occurred after cutting and while the grain was in stook. On tho experimental farm at Nappan, N. S., the yield in plot culture has been quite phenomenal, having reached 104 bushels 19 lbs. per acre, weighing $38\frac{1}{2}$ lbs. per bushel. At Brandon, Man., these oats have given 54 bushels 15 lbs. per acre, weighing 39 lbs. per bushel, and at Indian Head, N.W.T., 82 to 86 bushels per acre, the grain having reached the extraordinary weight of 47 to $48\frac{1}{2}$ lbs. per bushel. At Agassiz, B. C., the return has been smaller, being 28 bushels 28 lbs. per acre. These oats maintain their character for earliness, ripening usually from two or three days to a week earlier than many other sorts. In the following series of results by provinces, a summary is first given, followed by extracts from a few of the reports received from those farmers who have had the largest yields from the 3-lb. samples:—

PRINCE EDWARD ISLAND.

Number of reports received, 16; average yield from 3 lbs., $63\frac{13}{16}$ lbs.; average weight per bushel, $43\frac{1}{16}$ lbs. The heaviest sample weighed 45 lbs. per bushel, and was grown by Robert Wood, of Mount Herbert, who reports a yield of 60 lbs.

John Clark, of Alberton, had 85 lbs. from the 3 lbs. sown, and says: "Sown broadcast on heavy clay land 29th April; harvested 25th August; no rust or smut; straw very strong and white. This grain ripens ten days earlier than any other." The sample returned weighed $42\frac{1}{2}$ lbs. per bushel.

Robert Shaw, of Piusville, reports a yield of 70 lbs. He says: "Sown broadcast 2nd June on heavy land newly burnt; harvested 5th September; no rust or smut; straw bright; ripens earlier than any other oats sown and gives double the yield. Would like you to favour me with some more samples." This grain weighed 44 lbs. per bushel.

NOVA SCOTIA.

Number of reports received, 50; average yield, $63\frac{1}{5}$ lbs.; average weight per bushel, $40\frac{1}{4}$ lbs. The heaviest sample was grown by Andrew McFarlane, of Antigonish; it weighed $44\frac{1}{4}$ lbs. and the yield was 55 lbs.

James Northrup, of Harbourville, reports a yield of 155 lbs. from a sowing of $\frac{5}{8}$ths of 3 lbs. of seed, and says: "Sown in drills 25th May on dry, loamy soil; har-

vested 14th September; there was no rust, but some smut; straw very stout; several days earlier than the Banner or any other kind that I sowed, and heavier. I consider them very fine oats." The sample returned weighed 39 lbs. per bushel.

H. Sabean, of New Tusket, harvested 150 lbs. from 3 lbs. sown, and reports as follows: "Sown broadcast 3rd May on gravelly loam; harvested 12th August; no rust or smut; straw very stout; ripens early; heavier than any other sort sown." Sample returned weighed $42\frac{1}{4}$ lbs. per bushel.

Jabez McLennan, of North Brookfield, reports a yield of 143 lbs. from 3 lbs. sown, and says: "Sown broadcast 10th May on rich, dry, loamy soil, top dressed with ashes; harvested 15th August; no smut or rust; straw very bright; stood up well; ripened about as other grain alongside; weighed much heavier, the heaviest oats I have ever seen." The sample returned weighed $42\frac{3}{4}$ lbs. per bushel.

NEW BRUNSWICK.

Number of reports received, 31. The average yield was $63\frac{1}{31}$ lbs. and the average weight 40 lbs. per bushel. The heaviest sample weighed $43\frac{3}{4}$ lbs. This was grown by H. V. Price, of Rogersville, who had a yield of 59 lbs.

J. E. Babineau, of Robichaud, reports a yield of 163 lbs. from 3 lbs. sown. He says:—Sown with the hand on heavy damp soil on the 27th of May; harvested 2nd September; no rust or smut; straw very large; ripens a little sooner than other oats, and much heavier." The weight of the sample returned was 40 lbs. per bushel.

William McCullough, of Manners Sutton, had 111 lbs. from 3 lbs. sown, and says: "Sown broadcast 24th May on light loam, top dressed; harvested 25th September; no rust; a little smut; straw very coarse; not as early as other grain, but ripened even." Weight of sample returned, $38\frac{1}{4}$ lbs. per bushel.

David Cunningham, of Hanwell, had a crop of 90 lbs., and reports as follows:—"Sown broadcast 12th May, on black loam; harvested 21st August; no rust or smut; straw very stout; as early as other sorts, with a better yield. I think them a good oat for this place." Weight of sample returned, 40 lbs. per bushel.

QUEBEC.

Number of reports received, 171; average yield, $70\frac{1}{2}$ lbs.; average weight per bushel, $39\frac{5}{28}$ lbs. The heaviest sample weighed $44\frac{1}{4}$ lbs. per bushel, and was grown by Joseph Guay, of Piopolis, who reports a yield of 85 lbs.

M. Godmer, of Ste. Adèle, reports a yield of 297 lbs. from 3 lbs. sown. He says: "Sown broadcast 8th May, on sandy loam, 86 x $86\frac{1}{2}$ feet; harvested 29th August; no rust or smut; straw much the same as others; grain heavier and earlier." The sample returned weighed $40\frac{1}{4}$ lbs. per bushel.

S. Audette, of St. Ubalde, had a yield of 220 lbs., and reports as follows: "Sown broadcast 20th May, on clay soil; harvested 10th September; there was much rust but no smut; earlier than other sorts and heavier also. If straw had kept straight up think I would have had 100 lbs. more." The sample returned weighed $34\frac{1}{2}$ lbs. per bushel.

George Maynard, of St. Foy, reports a yield of 162 lbs. from 3 lbs. of seed. He says: "Sown broadcast 8th May, on sandy soil, which grew oats last year; harvested 24th August; no rust or smut; straw of good quality; grain heavier and earlier than other sorts." The sample returned weighed $42\frac{1}{4}$ lbs. per bushel.

ONTARIO.

Number of reports received, 183; average yield, $89\frac{17}{18}$ lbs.; average weight per bushel, $38\frac{3}{4}$ lbs. The heaviest sample weighed $45\frac{1}{2}$ lbs. per bushel and was grown by P. Meiklejohn, of Sargison, who reports a yield of 129 lbs.

P. Generaux, of Nosbonsing, reports a yield from 3 lbs. sown of 6 bushels and 17 lbs. (221 lbs.) He says: "Sown 14th May on heavy sandy loam, 64 x 64 feet; harvested 25th August." The sample he returned weighed $39\frac{1}{2}$ lbs. per bushel.

John Edwards, of Rockland, had 190 lbs., and says: "Sown 29th April on clay loam, spring ploughed and top dressed with manure; plot 24 x 180 feet; harvested

5th August; no rust or smut; straw grew about 3 feet high and stood well. This grain is better than any ever raised on the farm." The weight of the sample returned was $36\frac{3}{4}$ lbs. per bushel.

Wm. Dunn, Sweet's Corners, had 170 lbs. from 3 lbs. sown, and says: "Sown in drills 1st May, on clay loam; sod ploughed in the fall; plot 33 x 154 feet; harvested 14th August; no rust; no smut; nice bright straw, 3 feet high. I think they are very fine oats. I will have enough to sow two acres next year." The sample returned weighed 37 lbs. per bushel.

John Wiley, of Foye's Hill, had 168 lbs. of oats, after cleaning, from 3 lbs. sown. He says: "Sown 12th May, on clay loam, top dressed; harvested 18th August; no rust; no smut; straw very long and stiff, clean and bright; ripened ten days earlier than our other oats and are heavier. They are the best oats grown in this section; took first prize at two of our township fairs." The weight of the sample returned by Mr. Wiley was $42\frac{1}{2}$ lbs. per bushel.

MANITOBA.

Number of reports received, 25; average yield, $88\frac{1}{2}$ lbs.; average weight per bushel, $37\frac{1}{3}$ lbs. The heaviest sample weighed $44\frac{1}{4}$ lbs., and was grown by A. Malcolm, of Oak Lake, who reports a yield of 20 lbs., and says that blackbirds destroyed most of the crop. George Forbes, of Rothwell, reports a yield of 200 lbs. from 3 lbs. He says: "Sown 27th April, on rich black loam; size of plot, 30 rods, and the width of a Patterson drill, every second cup stopped, and set at 1 bushel per acre; afterwards hoed between the rows. Harvested 1st September; had eleven stooks; badly rusted; no smut; straw very strong, over 6 feet long; think I would have had 400 or 500 lbs. only for rust and blackbirds. Am very proud of these oats; will give them a better chance next year and report again." The sample returned weighed $36\frac{1}{2}$ lbs. per bushel.

Chas. E. Ivens, of Virden, had a yield of 192 lbs. He says: "Sown 7th May, in drills 14 inches apart, on black loam 2 feet deep; 624 square yards; harvested 27th August; no smut or rust; straw long and soft. Ten days later than Bonanza, but the Bonanza was sown much thicker." Weight of sample returned, $40\frac{1}{4}$ lbs. per bushel.

R. Grun, of Emerald Hill, had 180 lbs. from 3 lbs. sown, and says: "Sown 8th May in drills, with press drill, on 9 square rods, on sandy loam; harvested 19th August; a little rust, nothing to hurt; no smut; straw very heavy and rank; ripened twenty days earlier than our other oats; they appear to be just what we want." The sample returned weighed 39 lbs. per bushel.

NORTH-WEST TERRITORIES.

Number of reports received, 21; average yield, $70\frac{1}{2}$ lbs; average weight per bushel, $38\frac{3}{8}$ lbs. The heaviest sample, which weighed $44\frac{1}{4}$ lbs. per bushel, was grown by T. G. Cooney, of Wascana, who reports a crop of 230 lbs.

T. G. Cooney, of Wascana, reports a yield of 230 lbs. from 3 lbs. of seed. He says: "Sown in drills 27th April, on very heavy clay soil; plot about 1 rod wide and 16 rods long; harvested 25th August; no rust or smut; straw from 5 to 6 feet high; leaves measured $1\frac{1}{2}$ inches in width; it partly lay down; ripens early and compares favourably with other varieties." The sample returned weighed $44\frac{1}{4}$ lbs. per bushel.

Chas. Gilroy, of Regina, had a yield of 128 lbs., and says: "Sown broadcast 16th April on heavy clay soil; size of plot, $16\frac{1}{2}$ x 130 feet; harvested 22nd August; no rust; no smut; straw coarse, 44 inches long." The sample Mr. Gilroy returned weighed 42 lbs. per bushel.

J. J. Porter, of Boharm, had 104 lbs. from 3 lbs. of seed, and says: "Sown with drill 24th April on rich loam; size of plot, 3 x 100 yards; harvested 5th September; some rust; no smut; ripened very uneven; lodged some; yield would have been much heavier had it ripened evenly; some of it was shelled before the balance was ripe." The sample returned weighed $42\frac{1}{2}$ lbs. per bushel.

BRITISH COLUMBIA.

Number of reports received, 2; average yield, 79 lbs.; average weight per bushel, 41½ lbs. The heaviest sample was grown by Hector Ferguson, of Port Haney, who reports a yield of 90 lbs., weighing 41½ lbs. per bushel.

Hector Ferguson, of Port Haney, had a yield of 90 lbs. from 3 lbs. of seed, and says: "Sown broadcast 8th May on an alluvial deposit of sand and clay; size of plot about 50 square yards; harvested 9th September; no rust or smut; straw good; ripens about the same time as the Bonanza, and is a first-class oat." The sample returned weighed 41½ lbs. per bushel.

Hugh Nichol, of Mission, had a crop of 68 lbs. He says: "Sown broadcast 10th April on sandy loam; size of plot, 7 yards by 12; harvested 8th August; no rust or smut; straw strong; ripens early; crop good. I am very well pleased with these oats." The sample returned weighed 40¾ lbs. per bushel.

Victoria Prize.

This is a short, plump, white oat, much like the Prize Cluster, but is not uniformly so good a cropper. On the Central Experimental Farm a yield of six acres averaged 26 bushels 29 lbs. per acre, weighing 39¾ lbs. per bushel. At the branch farm at Nappan, N.S., the experimental plots yielded 88 bushels 8 lbs. per acre, and at Agassiz, B.C., 25 bushels 30 lbs. per acre.

D. Collins, of Mink River road, P.E.I., had a crop of 67 lbs. from 3 lbs. of seed, and says: "Sown broadcast 5th May on light soil; size of plot, 20 square yards; harvested 19th August; no rust or smut; bright, clean straw; ripens about the same as our common black oats." The sample returned weighed 42¼ lbs. per bushel.

V. Penny, of Murray Harbour S., P.E.I., had 45 lbs. He says: "Sown broadcast 12th May on light soil; size of plot, 10 x 15; harvested 25th August; no rust or smut; straw soft; about six days earlier than other varieties." The weight of the sample returned was also 42¼ lbs. per bushel.

Hedly V. Price, of Rogersvile, N.B., had a yield of 83 lbs. from 3 lbs. of seed. He reports as follows: "Sown broadcast 27th May on sandy loam; size of plot, 12 x 100 feet; harvested 25th August; no rust; no smut; straw strong and stout; earlier than our black oats." The sample returned weighed 40½ lbs. per bushel.

Harvey Nesbit, of Manners Sutton, N.B., had 67 lbs. He says: "Sown broadcast 12th May, on heavy soil; size of plot, 6 x 30 yards; harvested 21st August; no rust; some smut; straw very coarse; is earlier than the other sorts we had." Weight of sample returned, 42¼ lbs. per bushel.

J. B. Hamblen, of Pictou, N.S., had a yield of 127 lbs., and says: "Sown broadcast 7th May on sandy loam; size of plot, 30 x 80 feet; harvested 26th August; no smut; no rust; straw tall, 5 feet high; very stout; it became so heavy that it lay down; not any earlier than other sorts." The weight of sample returned was 38½ lbs. per bushel.

W. B. Wallace, of Avondale, N.S., had 122 lbs. He says: "Sown broadcast about the last of May on clay loam; size of plot, 12 x 200 feet; do not know date of harvesting; no rust; no smut; straw remarkably strong; stood up well, better than Prize Cluster; think very favourably of these oats." Weight per bushel, 40 lbs.

A. E. Guerin, of St. Isidore, Quebec, had a yield of 87 lbs. from 3 lbs. of seed. He says: "Sown in drills 30th April, on sticky black soil; size of plot, 5 perches; harvested 10th August; no rust; some heads of smut; straw very strong and good; earlier and heavier than our other oats; a very useful sort for farmers." The sample returned weighed 39½ lbs. per bushel.

D. Leclair, of Ste. Thérèse de Blainville, Que., had 82 lbs., and reports as follows: "Sown broadcast 1st May on rich clay soil; size of plot, 12 x 108 feet; harvested 3rd August; no rust; some heads of smut; straw long, strong and hard." The weight of sample returned was 41½ lbs. per bushel.

Simeon Roberts, of Columbus, Ont., reports a yield of 205 lbs. He says: "Sown broadcast 21st April on clay loam; size of plot, 20 x 230 feet; harvested 17th August;

no rust; no smut; a good stiff straw; two days earlier than the Egyptian." The weight of the sample returned was 41½ lbs. per bushel.

J. D. Wager, of Enterprise, Ont., had 190 lbs., and says: "Sown broadcast 20th April on clay loam; size of plot, 15 x 35 yards; harvested 3rd August; no rust; no smut; big straw; about a week earlier than the Banner sown same date." Weight of sample returned, 39 lbs. per bushel.

L. Cameron, of Elder's Mills, Ont., had 162 lbs. He says: "Sown broadcast 21st April on clay loam; size of plot, 2½ x 4 rods; harvested first week in August; no rust; no smut; the best straw and oats that I ever had, and as early as any; I have been farming 35 years." Weight of sample returned was 39¾ lbs. per bushel.

A. Hobson, of Killarney, Man., had a yield of 170 lbs. He says: "Sown in drills 27th April on sandy loam; size of plot, $\frac{1}{20}$th of an acre; harvested 10th August; there was some rust; no smut; straw very strong and tall, and lodged badly." No sample received.

John Fizell, of Holmfield, Man., had 136 lbs., and says: "Sown by hand 23rd April on heavy black loam; size of plot, 25 x 72 feet; harvested 15th August; rusted badly; no smut; straw very heavy, about 6 feet high. I believe it was the heaviest crop cut in Manitoba; ripened a week earlier than Egyptian." No sample received.

J. J. Porte, of Boharm, N.W.T., had a crop of 98 lbs. He says: "Sown in drills 24th April, on loamy soil; size of plot, 3 x 100 yards; rusted a little; a few heads of smut; straw stout, 4½ feet long." Weight of sample returned, 41¾ lbs. per bushel.

C. Elton, Pincher Creek, N.W.T., had a yield of 91 lbs., and says: "Sown broadcast 24th April on sandy loam; size of plot, 39 x 39 feet; harvested 23rd September; very little rust and a little smut; straw strong, 4½ feet high." Weight of sample returned, 37½ lbs. per bushel.

Thomas James, of Spulmacheen, B.C., had a crop of 289 lbs. from 3 lbs. of seed. He says: "Sown broadcast 30th April on sandy loam; size of plot about ⅙th of an acre; harvested 11th August; no rust; a little smut; straw very good; about one week earlier than White Cave." The weight of the sample returned was 37½ lbs. per bushel.

Flying Scotchman.

This is a white oat, a little longer in the kernel than Prize Cluster or Victoria Prize, which has made a good record for itself, having proven generally prolific, healthy and vigorous. At the Central Experimental Farm it has varied from 48 bushels and 26 lbs. per acre to 29 bushels and 7 lbs. At Nappan, N.S., the experimental plots have returned at the rate of 95 bushels 10 lbs. per acre, and at Agassiz, B.C., 58 bushels 8 lbs. per acre.

John Clark, of Alberton, P.E.I., had a yield of 118 lbs. from 3 lbs. of seed. He says: "Sown broadcast 29th April on heavy clay soil; size of plot, 12½ x 15 yards; harvested 25th August; no rust; no smut; straw large and bright; much earlier than any other sort." The sample returned weighed 38½ lbs. per bushel.

J. B. R. Lea, of Victoria, P.E.I., had 89 lbs., and reports as follows: "Sown broadcast 23rd May on sandy loam at the rate of 2½ bushels to the acre; harvested 29th August; no rust; no smut; straw a fine growth, but broke down a week before harvest; earlier than most other sorts." The sample returned weighed 44½ lbs. per bushel.

Josiah Wood, M.P., of Sackville, N.B., had a crop of 78 lbs., and says: "Sown broadcast 16th May on sandy loam; size of plot, 13 x 120 feet; harvested 10th September; a little rust; no smut; straw tall and very stout; ripens earlier than other sorts we have been sowing. Our neighbours' hens and geese got in to this grain, otherwise we should have had a much larger yield." The sample returned weighed 36 lbs. per bushel.

H. Sabean, of New Tusket, N.S., had a yield of 125 lbs., and writes thus: "Sown broadcast 3rd May on gravelly loam; size of plot, 20 x 33 paces; harvested 12th

August; no rust; a little smut; straw stout; think very favourably of this oat, but it is not so heavy as Prize Cluster." The weight of the sample returned was 36½ lbs. per bushel.

F. Beaton, of Alexander, N. S., had 86 lbs., and says: "Sown broadcast 12th May on dry, loose soil; size of plot, 5 square rods; harvested 4th September; no rust; no smut; straw heavy and perfectly sound; a week later than Prize Cluster. The samples of Prize Cluster and Flying Scotchman are the best oats I ever raised." The weight of the sample returned was 39 lbs. per bushel.

Julien Beauvais, of Ste. Adèle, Que., had a crop of 138 lbs. from 3 lbs. of seed, and says: "Sown broadcast 10th May, on yellow soil; size of plot, 20 x 90 feet; harvested 27th August; no rust or smut; straw good and clean; is earlier and heavier than other varieties." The sample returned weighed 41¼ lbs. per bushel.

Isidore Plouffe, of Ste. Agathe, Que., had a yield of 129 lbs. He says: "Sown broadcast 15th May, on yellow soil; size of plot, 20 x 40 feet; harvested 20th August; no rust; no smut; straw long, fine and strong; ripened 15 days sooner than our other sorts; I counted 220 grains in one head." The weight of the sample returned was 38¼ lbs. per bushel.

Revd. S. A. Moreau, of Ste. Agathe, had a crop of 100 lbs. and says: "Sown broadcast 12th May, on yellow soil, well manured; size of plot, 18 x 40 feet; harvested 13th August; no rust or smut; straw long and very good; earlier than ordinary sorts. Farmers here preserve their yield from the samples as something very precious, and thank the experimental farm, as I do myself." The weight of the sample returned was 37½ lbs. per bushel.

A. R. McTavish, of Loch Garry, Ont., had a yield of 190 lbs. He writes thus: "Sown broadcast 29th April; on sandy soil, mixed with gravel; size of plot, 27 x 210 feet; harvested 14th August; no rust; no smut; straw bright and stands well; ripens earlier than any other sort I had. I am very well pleased with the oats." The weight of the sample returned was 38¼ lbs. per bushel.

John Lawrence, of Mandamin, Ont., had 166 lbs., and says: "Sown broadcast 22nd April, on sandy loam; size of plot, 360 square yards; harvested 8th August; no rust; no smut; straw very heavy, half lying down; four or five days later than Prize Cluster." The weight of the sample returned was 38½ lbs.

Jas. Callagher, of Bethany, Ont., had 135 lbs. He says: "Sown broadcast 25th April, on clay loam; size of plot, 5 x 50 yards; harvested 10th August; no rust; no smut; straw bright and strong; ripens six to eight days earlier than my other oats, and heavier in crop and weight of grain; a remarkably fine variety of oats for this part; I think they will prove to be the leading oat here." The weight of the sample returned was 39¾ lbs. per bushel.

John Clarkson, of Elkhorn, Man., had a yield of 170 lbs. He says: "Sown broadcast 13th April, on black sandy soil; size of plot, 480 square yards; harvested 20th August; no rust; no smut; straw 4 feet long, medium thickness; compares favourably with other oats, and yields better than any other sort I have." The weight of the sample returned was 34 lbs. per bushel.

Charles Gilroy, of Regina, N.-W.T., had a yield of 93 lbs., and says: "Sown broadcast 16th April, on heavy clay soil; size of plot, 16½ x 130 feet; harvested 24th August; no rust; no smut; straw coarse, and about 44 inches long." The weight of the sample returned was 38¾ lbs. per bushel.

Bonanza.

This is another white oat of fair promise, but closely resembles Prize Cluster and Victoria Prize. On the Central Experimental Farm it gave a crop in 1891 of 23 bushels and 30 lbs. per acre; at Nappan, N.S., 77 bushels 32 lbs.; at Indian Head, 72 bushels 22 lbs., and at Agassiz, B.C., 37 bushels 12 lbs.

Wm. G. Taylor, of North Bedeque, P.E.I., had a crop of 84 lbs., and says: "Sown broadcast 11th May, on light soil; size of plot, 210 square yards; harvested 20th August; no rust; no smut; straw coarse and bright; ripens about same time as Prize Cluster, and about ten days earlier than Egyptian. I consider the Bonanza to be

far superior to any other kind of white oats I have ever sown. I took first prize for sample at exhibition in October last." The sample returned was an excellent one, weighing 44¾ lbs. per bushel.

George E. Baxter, of Perth Centre, N.B., had a yield of 82 lbs., and says: "Sown broadcast 26th May, on a light loam; harvested the 4th September; no rust or smut; straw large and bright; very early; good yield." The sample returned weighed 38½ lbs. per bushel.

J. R. Taylor, of Rockland, N.B., had 77½ lbs., and reports as follows: "Sown broadcast 23rd May, on rather heavy loam; size of plot, 195 square yards; harvested 8th September; no rust or smut; straw stout and strong; about the same as others as regards earliness of ripening, but the grain is much heavier than what we usually raise here." The sample returned was very fine and weighed 43¼ lbs. per bushel.

John R. McKenzie, of Millsville, Pictou, N.S., had a yield of 74 lbs., and says: "Sown in drills 15th May, on gravelly loam; size of plot, about 40 feet square; harvested 25th August; no smut or rust; straw strong; did not lodge; the earliest I have ever sown, and never had such a yield before. If these oats do not run out they will be a great acquisition." The sample returned was an excellent one, weighing 43½ lbs. per bushel.

Henry C. Sabean, New Tusket, N.S., had 70 lbs., and says: "Sown broadcast 1st May, on gravelly loam; size of plot, 35 x 48 feet; harvested 18th August; some rust; no smut; straw stout, and stood up well." No sample was received in this instance.

E. Laferrière, of St. Sebastien, Quebec, had a yield of 92 lbs., and says: "Sown broadcast 13th May, on a mixed grey and yellow soil; size of plot, 18 x 126 feet; harvested 13th August; no rust; no smut; straw fairly good; ripened earlier than other varieties." The weight of this sample was also 43½ lbs. per bushel.

William Worden, of St. Paul's Station, Quebec, had 80 lbs., and writes: "Sown broadcast 25th April, on loamy clay soil; size of plot, 7 square rods; harvested 8th August; slightly rusted; no smut; straw coarse; among the earliest, and heavy." The weight of the sample returned was 39¼ lbs. per bushel.

L. Cameron, of Elder's Mills, Ont., had a crop of 152 lbs. from 3 lbs. of seed, and says: "Sown broadcast 21st April on clay loam; size of plot, 2½ x 4 rods; no rust; no smut; straw good and clean; I never had a finer yield." The weight of sample returned was 40 lbs. per bushel.

James Calwell, of Varna, Ont., had a yield of 122 lbs. He says: "Sown broadcoast 23rd April, on clay loam; size of plot, 540 square yards; date of harvesting not given; no rust or smut; straw a fair length; a little earlier than others." The sample returned in this instance also weighed 40 lbs. per bushel.

Allyn Hobson, of Killarney, Man., had a crop of 170 lbs., and says: "Sown in drills 27th April, on sandy loam; size of plot, $\frac{1}{20}$ of an acre; harvested 10th August; plenty of rust; no smut; straw very strong and tall, but badly broken down." The sample returned weighed 39 lbs. to the bushel.

James Reid, of Carman, Man., had 71 lbs., and says: "Sown in drills 8th May, on black loam; size of plot, 7 rods; no rust; no smut; straw strong and stiff; ripened two weeks earlier than black oats and as early as Prize Cluster. They are the best oats I ever sowed." The sample returned weighed 41 lbs. per bushel.

C. Eaton, of Pincher Creek, N.W.T., had a crop of 89 lbs., and writes: "Sown broadcast 24th April on sandy loam; size of plot, 39 x 39; harvested 22nd September; about 10 per cent slightly rusted; a few heads of smut; straw strong and bright, 5 ft. 3 in. in height; ripens about same date as the Banner and gives about same weight of crop." The sample returned weighed 37¼ lbs. per bushel.

L. Zuichon, Port Guichon, B.C., had a yield of 164 lbs. from 3 lbs. of seed, and says: "Sown broadcast 29th April on delta lands; size of plot, 15 x 49 ft.; harvested 15th August; no rust or smut; average weight, good; first class seed." The sample returned was an excellent one, weighing 44¼ lbs. per bushel.

J. M. Sweetman, of Chilliwack, B.C., had 85 lbs. He says: "Sown broadcast 17th April on sandy clay soil; harvested 10th August; no smut or rust; straw long

and heavy; ten days earlier than the Banner." The sample returned in this instance was also first-class, weighing 43½ lbs. per bushel.

Banner.

This very promising variety has made a good record for itself during the past season. It is a branching oat, with a long kernel, not very plump or heavy, but very vigorous and productive; on the Central Experimental Farm it has varied in yield on different soils from 87 bushels 22 lbs. to 37 bushels 13 lbs. per acre. At the branch farm at Nappan, N.S., it has given on experimental plots at the rate of 94 bushels 4 lbs. per acre; at Brandon, Manitoba, 81 bushels 33 lbs.; at Indian Head, N.W.T., 86 bushels 24 lbs., and at Agassiz, B.C., 73 bushels 32 lbs. per acre.

A. A. Moore, of Pownal, P.E.I., reports a yield of 136 lbs. from a 3-lb. bag of seed. He says: "Sown broadcast 11th May, on clay loam; size of plot, 12 x 18 yards; harvested 30th August; no rust or smut; straw strong and bright." The weight of the sample returned was 36½ lbs. per bushel.

O. J. McLean, of Little Sands, P.E.I., had 102¾ lbs., and says: "Sown broadcast 23rd May on good soil; size of plot, 15 x 125 feet; harvested 9th September; no rust or smut; straw stout and clean. I find these oats to be the best of all I have grown." The sample returned weighed 35 lbs. per bushel.

Walter Piercy, of Manners Sutton, N.B., had a yield of 158 lbs. from 3 lbs. sown. He reports as follows: "Sown 11th May, broadcast, on sandy loam; size of plot, 500 square yards; no rust; some smut; straw 5 feet long; bright yellow. I like the oats well." The sample returned weighed 35¼ lbs. per bushel.

A. T. Fawcett, of Sackville, harvested 86 lbs., and says: "Sown broadcast 27th April, on sandy loam; size of plot, 5 x 35 yds.; harvested 24th August; no rust or smut; straw 3 feet long, rather inclined to go down." The weight of the sample returned was 34¼ lbs. per bushel.

John Lacey, of West Caledonia, N.S., had 119 lbs. from 3 lbs. of seed, and says: "Sown broadcast 4th May on sandy loam; size of plot 2 rods by 4; harvested 17th August; no rust or smut; straw tall and bright. Not quite so early as some other varieties, but somewhat heavier." No sample was received with this return.

John McBride, of Whitburn, N.S., had a yield of 74 lbs., and says: "Sown broadcast 9th May; size of plot, 1 rod by 8; harvested 9th September; no rust or smut; straw good, heavy and tall. I am pleased with the Banner oats." The sample returned weighed 34¼ lbs. per bushel.

Narcisse Barry, of Ste. Anne de la Pérade, Quebec, reports a yield of 202 lbs. He says: "Sown broadcast 20th May; size of plot, 30 x 20 feet; harvested 25th August; no rust or smut; straw good, and notwithstanding it is coarse the animals eat it well; the yield is extraordinary, and in two or three years I can sow my farm with this variety alone." The weight of the sample returned was 31¾ lbs. per bushel.

H. Newham, of Upper Thorn Centre, Quebec, had a yield of 100 lbs., and says: "Sown broadcast 5th May on sandy loam; size of plot, 6 x 55 yards; harvested 29th August; no rust; no smut; straw long and white; ripened about the same time as other sorts." The weight of the sample returned was 34¾ lbs. per bushel.

B. Bouck, of Inkerman, Ont., reports a yield of 130 lbs. He says: "Sown broadcast 9th May, on gravelly soil; size of plot, 1 rod by 10; harvested 22nd August; no rust or smut; straw coarse." The weight of the sample returned was 35¼ lbs per bushel.

Thos. Grant, of Sheffield, Ont., had 127½ lbs., and says: "Sown in drills 4th May, on sandy loam; size of plot, 2 x 62 yards; harvested 14th August; very little rust; no smut; straw pretty strong, 3½ to 4 feet high; about six days later than Flying Scotchman; would have been much heavier if they had not been so much lodged." Weight of sample returned, 34 lbs per bushel.

Geo. Barclay, of Morris, Man., had 103 lbs. He says: "Sown 5th May, on black loam, with press drill; size of plot, 2 x 99 yards; harvested 20 August; no rust or smut; straw strong and stiff; three days later than Prize Cluster, 4 days

earlier than Egyptian; good yielder; stood up well." Weight of sample returned, 36 lbs. per bushel.

A. Hobson, of Killarney, Man., reports a yield of 100 lbs., and says: "Sown broadcast 15th May, on sandy loam; harvested 4th September; no rust or smut; straw strong and clean." Weight of sample returned, 34 lbs. per bushel.

American Triumph.

A few reports have been received, giving the results of the test of samples of this grain. They nearly all speak of the variety as being late, and this agrees with our experience in Ottawa. The largest yield reported from Quebec is 60 lbs., the lowest 33 lbs.; the largest yield from Ontario, 110 lbs., and the lowest 24 lbs.; all the samples returned were deficient in weight. At the Central Experimental Farm it has given a crop of 37 bushels 16 lbs. per acre. At the branch farm, at Nappan, at the rate of 77 bushels 22 lbs.; at Brandon, Man., 59 bushels 26 lbs., and at Agassiz, B.C., 39 bushels 24 lbs. As there are many earlier-ripening varieties which have given on the average much better results, there seems no special reason for continuing the distribution of the American Triumph.

No reports have yet been received relating to the few samples of Egyptian oats distributed.

Two-rowed Barley.

Prize Prolific (Carter's.)

This useful variety has been widely distributed, and the reports of the past season are on the whole very favourable. In some localities the straw is reported to be weak, a failing which in wet seasons seems to be common to all the two-rowed barleys of the Chevalier type, not because the straw is less stout than other sorts, but because the *pendant* head when weighted with water proves a much greater strain on the straw than do the more upright heads which characterize the Duckbill, Goldthorpe, Italian and other sorts of that class. At the Central Experimental the Prize Prolific barley has yielded in different fields and plots from 33 bushels 18 lbs. to 65 bushels 10 lbs.; at the branch farm, at Nappan, N.S., 50 bushels; at Brandon, Man.; 75 bushels 54 lbs.; at Indian Head, N.W.T., from 45 to 54 bushels 28 lbs., and at Agassiz, B.C., 32 bushels 39 lbs.

A. A. McNeill, of Alberton, P.E.I., had a crop of 125 lbs. from 3 lbs. seed, and says: "Sown broadcast 5th May, on sandy loam; size of plot, 5 x 50 yards; no rust or smut; straw clean and bright; about 5 days earlier than other barley. I never saw better heads and stems; stood up well and ripened even." The sample returned weighed 53½ lbs. per bushel.

Isaac M. Doughart, of Long River, New London, P.E.I., had 100 lbs. He says: "Sown broadcast 27th May on sandy loam; harvested 13th September; no rust or smut; straw bright yellow; ripens no earlier than our own." The sample returned weighed 48¼ lbs. per bushel.

James Friar, of Shediac, N.B., had a yield of 52 lbs., and says: "Sown broadcast 6th June, on sandy loam, on 100 square feet; harvested 16th September; no rust or smut; straw long and stout, but rather soft; ripens later than most varieties." The sample returned weighed 47¾ lbs. per bushel.

Percy Randall, of Bayfield, Antigonish, N. S., had a crop of 51 lbs. He says: "Sown broadcast on 6th June on light sandy loam; size of plot, 7 x 26 yards; harvested 28th September; no rust or smut; straw bright and heavy; compares favourably with other sorts." The sample returned weighed 48¾ lbs. per bushel.

Peter Devoe, of Little Bras d'Or (south side), N.S., had 42 lbs., and says: "Sown broadcast 16th May, on dry sandy soil; harvested 4th September; no rust or smut; straw coarse; ripens about the same time as other sorts." Sample returned weighed 52¼ lbs. per bushel.

George Maynard, of St. Foy, Que., reports a yield of 180 lbs. from 3 lbs. of seed. He says: "Sown broadcast 26th May, on gray sticky soil; size of plot, 45 x 135 feet;

harvested 20th August; no rust or smut; straw soft. I prefer the six-rowed barley." The weight of the sample returned was 51¾ lbs. per bushel.

E. Lafférière, of St. Sebastien, Que., had 90 lbs. and says: "Sown broadcast 13th May, on grey soil; size of plot, 18 x 126; harvested 18th August; no rust or smut; straw fairly good; is a good weight, but takes longer to ripen than the six-rowed." The sample returned weighed 52¾ lbs. per bushel.

S. Rennie, of Millikin, Ont., had 132 lbs., and says: "Sown broadcast 21st April on clay loam; harvested 5th August; no rust or smut; straw very soft and weak; about 2 days later than the Duckbill and about 3 bushels less per acre in yield." Sample failed to reach us.

A. R. McTavish, of Loch Garry, Ont., had a yield of 126 lbs. He says: "Sown broadcast 29th April on sandy soil mixed with gravel; size of plot, 19 x 210 feet; harvested 12th August; no rust or smut; straw long and clean." The sample returned weighed 52¼ lbs per bushel.

Wm. A. Wallis, of Humber, Ont., had a crop of 120 lbs. He says: "Sown in drills 22nd April on good clay loam; size of plot, 8 square rods; harvested 11th August; no rust or smut; straw not so strong as Chevalier or Duckbill, and several days later." The sample returned weighed 52 lbs. per bushel.

Samuel Finnegan, of Freshfield, Man., had a yield of 82 lbs. and says: "Sown in drills 1st May on sandy loam; size of plot, 12 x 87 feet; harvested 22nd August; no rust or smut; straw stiff, and 3 feet long; has eclipsed all other sorts in this neighbourhood." The weight of the sample returned was 54 lbs. per bushel.

James H. Fry, of Virden, Man., had 62 lbs., and says: "Sown broadcast 13th April on sandy loam; size of plot, 2 x 16 rods; harvested 8th August; no rust or smut; straw strong and bright, 39 inches high; three days earlier than other sorts." Weight of sample returned, 54 lbs. per bushel.

L. Zuichon, of Port Guichon, B.C., reports a yield of 158 lbs. from 3 lbs. sown, and says: "Sown broadcast 29th April on delta lands; size of plot, 37 x 43 feet; harvested 15th August; no rust or smut; grain heavier than average; profitable seed for British Columbia." The weight of the sample returned was 55 lbs. per bushel.

J. McSweetman, of Chilliwack, B.C., had 70 lbs., and says: "Sown broadcast 17th April on sandy clay; size of plot, 4 square rods; harvested 10th August; no rust or smut; straw good, but it lodged; is earlier than common." The weight of the sample returned was 51¼ lbs. per bushel.

Danish Chevalier.

At the Central Experimental Farm this variety gave crops varying from 41 bushels 40 lbs. to 43 bushels 41 lbs. At the experimental farm at Nappan the crop was 44 bushels 8 lbs.; at Brandon, Man., 68 bushels 16 lbs.; at Indian Head, N.W.T., 44 bushels 20 lbs.; and at Agassiz, B.C., 33 bushels 36 lbs.

A. A. Moore, of Pownal, P.E.I., had a crop of 67 lbs. from 3 lbs. of seed, and says: "Sown broadcast 11th May on clay loam; size of plot, 12 x 18 yards; harvested 25th August; no rust or smut; straw nice and bright, but soft." No sample received.

E. Lunden, of Canterbury, N.B., had a crop of 39 lbs., and says: "Sown in drills 14th May on sandy loam; size of plot, 17 x 71 feet; harvested 17th August; no rust or smut; straw medium height and good size, but lodged." The weight of the sample returned was 53 lbs. per bushel.

W. Dukeshire, of Maitland, N.S., had a crop of 60 lbs., and says: "Sown broadcast 20th May on light, loamy soil; harvested 16th August; no rust or smut; straw good; it exceeds any other we have." The sample returned weighed 51¼ lbs. per bushel.

Allan McLennan, of North Brookfield, N.S., had a yield of 57 lbs., and says: "Sown broadcast 10th May on clay loam; size of plot, 9 square rods; harvested 28th August; no rust or smut; straw rather short; a little later than other sorts." The sample returned weighed 50½ lbs. per bushel.

Pierre Zippens, of Roberval, Lake St. John, Que., reports a yield of 187 lbs. from 2½ lbs. of seed sown, and says: "Sown broadcast 10th June, on clay soil; size of plot, 30 x 40 feet; harvested 15th October; no rust; straw good." The weight of the sample returned was 51¾ lbs. per bushel.

J. A. Villeneuve, of Charlesbourg, Que., had a crop of 75 lbs., and says: "Sown broadcast 16th May, on virgin soil; size of plot, 15 x 150 feet; harvested 29th August; no rust or smut; straw ordinary." Weight of sample returned, 50¼ lbs. per bushel.

Roderick McLennan, Paisley, Ont., had a yield of 145 lbs. from 3 lbs. sown, and says: "Sown broadcast 1st May, on loamy soil; size of plot, about 10 square yards; harvested 16th August; no rust or smut; very long straw; grain very late, and met with bad weather." Weight of sample sent, 47½ lbs. per bushel.

Robert Davidson, of Bowsville, Ont., had 125 lbs., and says: "Sown broadcast 1st May, on clay soil; harvested 13th August; no rust or smut; straw good; as to time of ripening, just the same as our own." The weight of this sample was 52 lbs. per bushel.

A. Hobson, of Killarney, Man., had a yield of 150 lbs. He says: "Sown in drills 27th April, on sandy loam; size of plot, $\frac{1}{20}$ of an acre; harvested 10th August; no rust or smut; a fine straw, but lodged badly." The weight of the sample returned was 52¼ lbs. per bushel.

John Clarkson, of Elkhorn, Man., had 108 lbs., and says: "Sown broadcast 13th April, on black sandy soil; harvested 21st August; no rust or smut; straw medium length; later in ripening than six-rowed, and 20 bushels per acre less than Prize Prolific last year." Weight of sample returned, 50¾ lbs. per bushel.

T. G. Cooney, of Wascana, N.W.T., reports a yield of 263 lbs. from 3 lbs. of seed, and says: "Sown in drills 27th April, on heavy clay; size of plot, 1½ x 16 rods; harvested 25th August; no rust or smut; straw medium height, partly lodged. I think this a very excellent barley for this part of the country." The sample returned weighed 51 lbs. per bushel.

George Byers, of Red Deer, N.W.T., had 68 lbs. He says: "Sown broadcast, 20th April, on sandy loam; size of plot, 144 square yards; harvested 14th August; no rust; about 1 per cent of smut; straw bright and clean, but inclined to lodge." The weight of the sample returned was 52¼ lbs. per bushel.

Hugh Nichol, of Mission, B.C., had a crop of 56 lbs., and writes: "Sown broadcast 10th April, on sandy loam; size of plot, 10 x 12 yards; harvested 1st August; no rust or smut; straw fine." No sample received.

Golden Melon.

The yield of this variety has varied on different plots on the Central Experimental Farm from 21 bushels 9 lbs. to 43 bushels and 40 lbs. per acre. At Nappan the yield has been 52 bushels 4 lbs. per acre; at Indian Head, N.W.T., 42 bushels 10 lbs., and at Agassiz 36 bushels and 2 lbs. per acre.

C. A. Hardy, of Joggin Bridge, N.S., had a yield of 138 lbs., and says: "Sown broadcast 6th May, on light dry soil; size of plot, 11 square rods; harvested 24th August; no rust or smut; straw brittle; I think this is the largest yield of barley in this neighbourhood." Weight of the sample returned, 50¼ lbs. per bushel.

S. Audette, of St. Ubalde, Que., had a yield of 115 lbs. He says: "Sown broadcast 20th May, on black soil; size of plot, 20 x 180 feet; harvested 1st September; no rust or smut; straw good; it seems finer than other sorts." Weight of sample returned, 47½ lbs. per bushel.

L. Langevin, Baie des Pères, Que., had a crop of 99 lbs., and writes: "Sown broadcast 27th April, on sandy clay soil; size of plot, nearly 30 feet square; harvested 27th August; straw of good growth; a little late, but a heavy crop." Weight of sample returned, 49 lbs. per bushel.

J. S. McDonald of Ripley, Ont., had a yield of 110 lbs. from 3 lbs. of seed. He says: "Sown broadcast 17th May, on clay loam; harvested 23rd August; no rust or smut; straw of good size; two weeks later than six-rowed; harvest season very wet." Weight of the sample returned 50½ lbs. per bushel.

A. A. Moody, of Brock Road, Guelph, Ont., had 83½ lbs., and writes: "Sown broadcast 6th May, on clay loam; size of plot, 27 x 66 feet; harvested 22nd August; no smut; no rust; straw a good length; head very long." No sample received.

A. Ferguson, of Virden, Man., had a crop of 65 lbs., and says: "Sown broadcast 20th April, on heavy black loam; size of plot, 7 x 216 feet; harvested 19th August; no smut; no rust; straw very good and bright; a few days earlier than Danish Chevalier, and stood up better." No sample received.

James Speers, of Wapella, N.W.T., had a crop of 72 lbs. He says: "Sown broadcast 14th April, on black loam; size of plot, 160 square yards; harvested 6th September; no rust or smut; straw very soft. Ten days later than another variety I had." Sample received weighed 48¼ lbs. per bushel.

Webb's Kinver Chevalier.

A supply of this fine variety of barley, which has carried off so many prizes in England, was purchased early in the year from Edward Webb & Son, of Wordsley, England. On arrival part of the seed was divided among the experimental farms for test; the remainder furnished material for a limited distribution among farmers in the several provinces of the Dominion. At the Central Experimental Farm the crop on one field was 42 bushels and 36 lbs. per acre, on another 58 bushels and 2 lbs. At Nappan, N. S., the yield was 48 bushels 16 lbs.; at Brandon, Man., 61 bushels 17 lbs., and at Agassiz, 20 bushels and 40 lbs. per acre.

M. D. Blue, of Little Sands, P.E.I., had a yield of 42 lbs. from 3 lbs. of seed, and says: "Sown broadcast 4th June, on clay land; size of plot, 10 x 20 yards; harvested 9th September; no rust or smut; straw white. I believe it is suitable for this locality." The weight of the sample returned was 50½ lbs. per bushel.

David Cunningham, of Hanwell, N.B., had a crop of 76 lbs. He says: "Sown broadcast 12th May, on black loam; size of plot, 18 x 75 feet; harvested 21st August; no rust or smut; straw good and strong. I think this will be a good kind for this place." Weight of sample returned, 53½ lbs. per bushel.

John Lacey, of Caledonia, N. S., had 56 lbs., and says: "Sown broadcast 4th May, on sandy loam; size of plot, 1½ x 4 rods; harvested 14 August; no rust or smut; straw very short and bright; not so early by five days as other barley grown here." The weight of the sample returned was 53 lbs. per bushel.

B. Paquette, of St. Nicholas, Quebec, had a yield of 78 lbs. He says: "Sown broadcast 12th May, on dry soil; size of plot, 10 x 160 feet; harvested 29th August; no rust or smut; straw very good. This grain is to be recommended; the yield is very satisfactory." Sample returned weighed 52 lbs. per bushel.

R. W. Ralph, of Shawville, had 70 lbs., and reports as follows: "Sown broadcast 1st May, on sandy loam; size of plot, 204 square yards; harvested 6th August; no rust or smut; straw very short." The weight of the sample returned was 52½ lbs. per bushel.

Walter H. Percival, of Burritt's Rapids, Ont., reports the extraordinary yield of 336 lbs. He says: "Sown by hand 9th April, on clay loam; size of plot, 3 rods square; harvested 17th August; no rust or smut; straw long and bright, standing up well. I sowed it very thin; it was a heavy crop. I like it remarkably well and will sow no other barley next year." The weight of the sample returned was 54¼ lbs. per bushel.

John McCullam, of Belgrave, Ont., had a crop of 103 lbs., and says: "Sown broadcast 25th April, on dark clay loam (date of harvesting is not given); no rust of any account; no smut; straw a good length, bright and strong; cut same time as the Prize Prolific. I think this is a very good barley." The sample sent back weighed 54 lbs. per bushel.

Goldthorpe.

This variety of two-rowed barley was imported from James Carter & Co., of London, England, two years ago. It very much resembles the Duckbill in habit of growth, but the grain is said to be superior, with a thinner skin on the kernel. The

crop has varied on different soils on the Central Experimental Farm, from 49 bushels 28 lbs. to 29 bushels and 6 lbs. per acre. On the Nappan N.S., farm it has yielded at the rate of 47 bushels per acre; at Brandon, Man., 65 bushels 21 lbs.; and at Agassiz, B.C., 42 bushels and 4 lbs. per acre.

James T. Barnes, of Sussex, N. B., had a crop of 113 lbs., and says: "Sown broadcast 2nd June, on clayey soil; harvested 15th September; no rust or smut; straw short, but clean and bright; much later than six-rowed." Weight of sample returned, 48 lbs. per bushel.

William C. Burgman, of Tatamagouche, N. S., had 48 lbs., and says: "Sown broadcast 15th June, on intervale soil; harvested 22nd September. A heavy wind a week before harvest blighted it some; no smut; straw very heavy; two weeks later than six-rowed. I think it is a very fine barley."

A. Lacroix, of Scott's Junction, Que., had a yield of 122 lbs. from 3 lbs. of seed. He says: "Sown broadcast 1st June, on clay soil; plot not measured; harvested early in August; no rust or smut; straw of good quality. I found it superior to other sorts." The weight of the sample returned was 50 lbs. per bushel.

Louis Fournier, of St. Andrews, Que., had a crop of 100 lbs., and says: "Sown broadcast 20th May, on loamy clay; size of plot, 36 x 45 feet; (date of harvesting not given); no rust or smut; straw good." Weight of sample returned, 51 lbs. per bushel.

Samuel A. Zinkinson, of Ashton, Ont., had a crop of 98 lbs., and says: "Sown broadcast 29th April, on clay loam; size of plot, 7 x 21 yards; no rust or smut; straw long and strong." No sample received.

Chas. Scott, White Oak, Ont., had a yield of 90 lbs., and says: "Sown in drills 2nd May, on clay loam; size of plot, $6\frac{1}{2}$ x 165 feet; harvested 10th August; a little rust; no smut; straw long, with heavy heads." Weight of sample returned, $50\frac{1}{2}$ lbs. per bushel.

J. B. Clabb, of Melita, Man., had a yield of 150 lbs. He says: "Sown broadcast 12th May, on clay loam; harvested 12th September; no rust or smut; straw very bright; stood erect. There would have been fully 200 lbs., but for the friendliness of my neighbour's cow." No sample received.

A. Hobson, of Killarney, Man., had 120 lbs., and says: "Sown in drills 27th April, on sandy loam; size of plot, $\frac{1}{20}$th of an acre; harvested 10th August; no rust or smut; straw clean and strong; stood up well. This is my favourite barley for this part." The weight of the sample returned was 51 lbs. per bushel.

Henry M. Hayward, of Hayward, N.W.T., had a crop of 75 lbs. He reports as follows: "Sown broadcast 16th May, on black loam, with gravelly sub-soil; size of plot, 5 x 20 yards; harvested 4th September; no rust or smut; straw long and very strong, with ears remarkably upright. Is earlier and much stronger than Chevalier or Prize Prolific; the two latter were very badly laid by a storm, but Goldthorpe growing alongside stood up well." The weight of the sample returned was $50\frac{1}{2}$ lbs. per bushel.

Francis Pow, of Wolseley, reports a yield of about a bushel, and says: "Sown broadcast 25th April, on black loam; size of plot, 5 x 7 yards; harvested 5th September; no rust; very little smut; straw long and bright; ten days later than six-rowed barley in same field." The weight of sample returned was $54\frac{1}{2}$ lbs. per bushel.

Saale.

This well known and highly esteemed sort was imported from England two years ago, and tested in 1890 on the Central Farm, when it gave very good returns. During 1891 it has yielded on this farm 47 bushels and 20 lbs. per acre. At the branch farm at Nappan, N.S., the yield has been 51 bushels 32 lbs., and at Agassiz, B.C., 33 bushels 26 lbs.

W. J. Fraser, of North River, Lot 32, P.E.I., had a yield of 106 lbs. and says: "Sown broadcast 2nd May, on sandy loam; size of plot, 8 x 12 yards; harvested 26th August; no rust or smut; straw strong and clean; matures early. This barley

is the best I have ever harvested. I think it will suit our climate well." The weight of the sample returned was 50½ lbs. per bushel.

Allan McLean, of Cornwall, P.E.I., had 76 lbs. He writes: "Sown broadcast 7th May, on clay loam; size of plot, 3 x 35 yards; harvested 22nd August; no rust or smut; straw very bright and good. I gave this sample a fair trial, no better than when sowing a large quantity." The weight of the sample returned was 53½ lbs. per bushel.

Honoré Lorlie, of the Quebec Seminary, Quebec, had a crop of 153 lbs. He says: "Sown broadcast 9th May, on grey soil; size of plot, 24 x 89 feet; harvested 10th August; no rust or smut; straw of medium strength, good and bright. I think this barley suitable for this district, and very profitable." The weight of the sample returned was 52¾ lbs. per bushel.

Pierre Mompetel, of Beauharnois, Que., had a yield of 102 lbs., and says: "Sown broadcast 24th April, on grey soil; size of plot, 14 x 100 feet; harvested 14th August; no rust or smut; straw good. Ripens sooner than the other two-rowed I had from you, and is heavier." Weight of sample returned, 50¼ lbs. per bushel.

John Marion, of Marion, Ont., reports a yield of 143 lbs., and says: "Sown broadcast 6th May on clay soil; size of plot, 20 x 50 yards; harvested 22nd August; no rust or smut; straw very long." The sample returned weighed 50 lbs. per bushel.

George Hume, of Ashgrove, Ont., had a crop of 92 lbs. He says: "Sown broadcast 25th April, on clay soil; size of plot, 18 x 105 feet; harvested 15th August; no rust or smut; straw, long, good and stiff; ten to twelve days later than six-rowed, but a much heavier crop." The weight of the sample returned was 53½ lbs. per bushel.

Chas. E. Ivans, of Virden, Man., reports a yield of 232 lbs., and says: "Sown in drills 14 inches apart 16th April, on deep black loam; size of plot, 540 square yards; harvested 24th August; no rust or smut; straw long and soft; was badly laid by rain storm." Weight of sample received, 49¾ lbs.

Spring Wheat.

Ladoga.

This early-ripening wheat continues to give good returns in many parts of the Dominion, succeeding best on comparatively light soils and in those districts where the summer season is short. On the Central Experimental Farm the yield has varied on different soils from 28 bushels 32 lbs. to 21 bushels 7 lbs.; at the branch farm, in Nappan, N.S., it has given a return of 30 bushels; at Brandon, Man., it has yielded 33 bushels; at Indian Head, on different plots, from 36 bushels 46 lbs. to 33 bushels 20 lbs., and at Agassiz, B.C., 18 bushels and 20 lbs. per acre.

Peter Chaisson, of Tignish, P.E.I., had a yield of 95 lbs. from 3 lbs. of seed. He says: "Sown by hand 20th May, on dry, loamy soil; size of plot, 21 x 60 ft.; harvested, 28th August; no rust or smut; straw 5 ft. long, coarse and bright. I find the Ladoga ripens 9 days earlier than any other kind I have, and yields heavier." The weight of the sample returned was 61 lbs. per bushel.

M. D. Blue, of Little Sands, P.E.I., had a crop of 73½ lbs., and reports as follows: "Sown broadcast 4th June on clay land; size of plot, 200 square yards; no rust; some smut; harvested a week earlier than other sorts sown same day. I believe it is suitable for this locality." The sample returned weighed 60 lbs. per bushel.

A. T. Fawcet, of Sackville, N.B., harvested 94 lbs., and writes: "Sown broadcast 27th April, on sandy loam; size of plot, 5 x 35 yards; no rust; considerable smut; straw bright and good, 3 ft. high; earlier than any other kind grown here. I am well pleased with the grain." The weight of the sample returned was 61¼ lbs. per bushel.

George Oulton, of Little Shemogue, N.B., reports a yield of 78 lbs., and says: "Sown broadcast 8th May, on clay loam; size of plot, 15 x 160 ft.; harvested 28th August; no rust or smut; good straw; seven days earlier than White Fife; yields

about twice as much ; I am well pleased with the wheat." The sample returned weighed 63 lbs. per bushel.

Walter Lawrence, of Cheticamp, N.S., had a crop of 135 lbs. He says: "Sown in drills 12th May, on dry, sandy soil; size of plot, 316⅔ square yards; harvested 4th September; no rust on grain, a little on straw; no smut; straw long and fairly strong." Sample returned weighed 60 lbs. per bushel.

A. Thomas, Milford, N.S., reports a yield of 110 lbs., and says: "Sown broadcast 22nd April, on sandy loam; size of plot, 3½ x 5½ rods; harvested 25th August; no rust or smut; straw very stout; ripens earlier than any other wheat." The sample returned weighed 63 lbs. per bushel.

James Cuthbertson, of Maple Ridge, Que., reports a yield of 221 lbs. He says: "Sown in drills 8th May, on clay loam; size of plot, 13 x 30 yards; harvested 18th August; no rust or smut; eight days earlier than White Fife, and a good deal heavier." The sample returned weighed 60½ lbs. per bushel.

R. Langlais, St. Philip, Que., had a yield of 114 lbs., and writes as follows: "Sown broadcast 12th May, on sandy soil; harvested 15th August; no rust or smut; straw long and white. This wheat is superior in earliness and weight." No sample received.

F. H. Doyle, of Lindsay, Ont., had a crop of 84 lbs., and says: "Sown broadcast 22nd April, on clay loam; harvested 5th August; no rust or smut; straw bright and stiff; about one week earlier in ripening than others. This wheat suits the land here well." The sample returned weighed 59¾ lbs. per bushel.

James McGahey, of Eden Valley, Ont., had 76 lbs. He says: "Sown broadcast 20th April, on heavy clay soil; size of plot, 20 x 60 feet; harvested 19th July; no rust; a little smut; straw stiff and good; was ripe 12 days earlier than Colorado sown same day; it will suit this land well." The sample returned weighed 61¼ lbs. per bushel.

Wm. Smith, of Griswold, Man., had a crop of 85 lbs., and says: "Sown broadcast 24th April, on sandy loam; size of plot, 25 x 80 feet; no rust; very smutty; straw long, and fairly strong growth. It did not ripen quite as early as Red Fife sown same time, and does not weigh as well." Weight of sample returned, 60 lbs. per bushel.

Thos. C. Boulton, of Nelson, Man., had a crop of 75 lbs. He says: "Sown broadcast 24th April, on clay loam; harvested 21st August; some rust; no smut; straw rather weak; ripened a week earlier than Red Fife sown same time." Weight of sample returned, 56½ lbs. per bushel.

G. Miller, of Carrsdale, N.W.T., had a yield of 105 lbs. from 3 lbs. of seed. He writes: "Sown broadcast 6th April; cannot give date of harvesting; was about a week earlier than White Fife sown same time; no rust or smut; straw bright and strong; it pleases me better than any other I have sown." The sample returned weighed 62½ lbs. per bushel.

Wm. Gobbett, of Dunmore Junction, N.W.T., had a crop of 80 lbs., and says: "Sown broadcast 23rd April, on clay loam; size of plot, 50 x 80 feet; no rust; some smut; straw clean, bright and strong, of medium length; ripened ten days earlier than any other wheat I had." The sample returned weighed 63½ lbs. per bushel.

L. Zuichon, of Port Guichon, B.C., had a yield of 143 lbs. from 3 lbs. of seed. He says: "Sown broadcast 29th April, on delta land; size of plot, 15 x 40 feet; harvested 20th August; no rust or smut; straw light." The sample returned weighed 64 lbs. per bushel.

John Callaghan, of Port Hammond, B.C., had 66 lbs., and says: "Sown broadcast 13th April, on sandy loam; size of plot, 20 x 80 feet; harvested 2nd August; some smut; straw fine." The weight of the sample returned was 62½ lbs. per bushel.

Campbell's White Chaff.

This variety of spring wheat, so promising for the eastern provinces, has again proved very productive. It is not, however, as yet a variety to be recommended for

Manitoba or the North-West Territories. It is too soft, and lacks that proportion of gluten which would make strong flour. On this account but very few samples have been sent to the western plains—only sufficient to test its productiveness there. At the Central Experimental Farm the crop has varied from 47 bushels and 50 lbs. per acre to 25 bushels and 23 lbs. At Nappan, N.S., it has yielded at the rate of 37 bushels 20 lbs.; at Brandon, Man., 43 bushels 45 lbs.; at Indian Head, on different plots, from 52 bushels to 33 bushels 56 lbs.; and at Agassiz, B.C., 21 bushels 10 lbs.

W. J. Fraser, of North River, Lot 32, P.E.I., had a yield of 90 lbs. from 3 lbs. of seed, and says: "Sown broadcast 2nd May, on sandy loam; size of plot, 8 x 12 yards; harvested 26th August; no rust or smut; straw bright and strong; ripens about the same time as White Russian. It is quite a success with me." The sample returned weighed 60¼ lbs. per bushel.

George McDougall, of Bangor, P.E.I., had 87 lbs. He says: "Sown broadcast 25th May, on rich sandy loam; size of plot, 160 square yards; harvested 7th August. A slight rust on part of crop; no smut; straw strong growth; none broken or lodged; ripened five days before White Russian." The weight of the sample returned was 62½ lbs.

J. B. Hamblen, of Pictou, N.S., reports a yield of 120 lbs. from 3 lbs. of seed. He says: "Sown broadcast 7th May, on sandy loam; size of plot, 30 x 80 feet; harvested 29th August; no rust or smut; straw 4½ feet high; does not ripen any earlier than other sorts, but gives a heavier yield." The weight of sample returned was 56½ lbs. per bushel.

R. D. Ross, of Bayview, N.S., had a crop of 70 lbs., and says: "Sown broadcast 7th May, on clay land; harvested 26th August; no rust; some smut; straw bright and very strong; eight days earlier than White Fife, sown same day. I consider this a very good variety of wheat. I took first prize at provincial exhibition at Halifax for best bushel white spring wheat with Campbell's White Chaff.

E. Lafférière, of St. Sébastien, Que., had a yield of 100 lbs. from 3 lbs. of seed. He says: "Sown broadcast 13th May, on grey soil; size of plot, 18 x 171 feet; harvested 31st August; no rust; some heads of smut; straw fairly good; ripened five or six days later than a bearded sort which I sowed. This which you sent is preferable." The sample returned weighed 61¼ lbs. per bushel.

R. A. Ralph, of Shawville, Que., had 90 lbs., and says: "Sown broadcast 1st May, on sandy loam; size of plot, 245 square yards; 1 bushel per acre; harvested 6th August; no rust or smut; straw short, clean and white; ripened about 6 days earlier than White Russian sown beside it, and I think yields about half as much more. I am proud of my wheat; would not take $5 for what I have from the 3 lbs." The weight of the sample returned was 61½ lbs. per bushel.

James McGuire, of Brinston's Corners, Ont., had a yield of 140 lbs. He writes: "Sown broadcast 22nd April, on gravelly soil; size of plot, 20 x 160 feet; harvested 8th August; no rust; a few heads of smut; straw good; is better than our own wheat grown alongside of it." The weight of the sample returned was 61 lbs. per bushel.

James Adams, of Newcastle, Ont., had 130 lbs., and says: "Sown broadcast 17th April, on clay loam; size of plot, 40 x 120 feet; harvested 10th August; no rust or smut; straw good; ripens early; a good wheat." The weight of the sample in this case was 60½ lbs. per bushel.

J. D. Wager, of Enterprise, Ont., had a crop of 92 lbs. He says: "Sown broadcast 17th April, on clay loam; size of plot, 15 x 30 yards; harvested 3rd August; no rust or smut; straw short, being parched by drought; about a week earlier than Fife wheat sown in same field." Weight of sample returned, 62 lbs. per bushel.

John Menary, of Holmfield, Man., had a crop of 75 lbs., and says: "Sown in drills 7th April, on clay loam; size of plot, 9 x 160 feet; badly rusted; a little smut; straw long; 8 days earlier than Red Fife; will try it again." No sample received.

Thomas James, of Spulmacheen, B.C., reports the extraordinary yield of 454 lbs. from 3 lbs. of seed. He says: "Sown by hand 30th April, on sandy loam; size of plot, ⅙ of an acre, harvested 22nd August; no rust or smut, straw grew rank, and lodged by heavy rain; ripens about the same time as ordinary wheat in this section; a much heaver yielder." The sample returned weighed 62¼ lbs. per bushel.

Hector Ferguson, of Port Haney, B.C., had a crop of about 100 lbs., and says: "Sown broadcast 9th May, on alluvial deposit; size of plot, about 50 square yds.; harvested 9th September; no rust; a little smut; straw strong and very good; about seven days later than the Ladoga. This is one of the best varieties I have seen, and yields far better than Ladoga or Red Fife." The sample returned weighed 61 lbs. per bushel.

Red Fife.

The Red Fife as grown in the Canadian North-West is one of the best wheats which the world produces. As grown there it is of the highest quality; is productive, and comparatively free from rust; when grown in the eastern provinces it is much less desirable. At the Central Experimental Farm it has during the last year produced a crop of 22 bushels and 25 lbs. per acre. At the experimental farm at Brandon, Man., it has varied on different soils from 29 bushels and 40 lbs. to 52 bushels 55 lbs.; at Indian Head, N.W.T., from 38 bushels 20 lbs. to 51 bushels 10 lbs.; and at Agassiz, B.C., it has yielded 21 bushels and 40 lbs. per acre.

James Boulter, of Little Pierre Jacques, P.E.I., had a crop of 70 lbs., and says: "Sown broadcast 12th May, on dry hardwood land; size of plot, $\frac{1}{8}$ acre; harvested 10th September; some rust; no smut; straw rusty in spots. I think it will do well here on a dry season, but if wet I think it will rust." Weight of sample received, 61 lbs. per bushel.

John Rutherford, of Tweedside, N.B., had a yield of 96 lbs. from 3 lbs. of seed, and says: "Sown broadcast 20th May, on dark heavy loam; harvested 20th September; no rust or smut; straw bright, tall, and stood up well." No sample was received.

John Corregan, of Caledonia, N.S., had 80 lbs. He says: "Sown broadcast 21st May, on heavy soil; size of plot, 2 x 6 rods; harvested 8th September; no rust or smut; straw heavy and coarse." The sample returned weighed 61 lbs. per bushel.

P. Beauchamp, of Valencay, Que., had a crop of 40 lbs., and says: "Sown broadcast 8th May, on clay soil; size of plot, 15 x 100 feet; harvested 4th September; a little rust or smut; straw medium." The sample returned weighed 59 lbs. per bushel.

Augustine Doyon, of St. Frederick Station, Que., had a yield of 38 lbs. He says: "Sown broadcast 15th May, on sandy soil; harvested 3rd September; no rust or smut; straw good and white." The weight of the sample returned was 62½ lbs. per bushel.

John Leach, of Cape Amable, Ont., had a yield of 60 lbs. He says: "Sown broadcast 4th May, on sandy loam; size of plot, 11 x 30 yards; harvested 10th September; no rust or smut; straw short and stiff." The weight of this sample was 61 lbs. per bushel.

Ernest Morgan, of Kerwood, Ontario, reports also a yield of 60 lbs., and says: "Sown in drills 28th April, on clay loam; size of plot, 12 x 165 feet; harvested 10th August; no rust or smut; straw bright and clean, and a good length." This was cut before it was ripe, and the sample returned was shrunken, and weighed 57¼ lbs. per bushel.

MULTIPLIER PEAS.

This promising variety of pea, which has produced very good crops on the experimental farms, was distributed in limited quantity for test.

Wm. Clark, of North Wiltshire, P.E.I., had a crop of 60 lbs. from 3 lbs. of seed, and says: "Sown 30th May; cut 15th September." The weight of the sample returned was 65¼ lbs. per bushel.

J. R. Taylor, of Port Elgin, N.B., had 100 lbs. He says: "Sown 6th May, on loamy soil; size of plot, 14 x 100 feet." Date of harvesting is not given. The weight of the sample returned was 64 lbs. per bushel.

W. J. Renyston, of Harmony Mills, N.B., had a crop of 90 lbs., and says: "Sown 2nd May, on loamy soil; harvested 15th August." Weight of sample returned, 66¾ lbs. per bushel.

John Smith, of Indian Brook, N.S., had a yield of 80 lbs., and says: "Sown 12th June, on dry soil; size of plot, 80 x 100 feet; harvested 16th September." The weight of the sample returned was 66¾ lbs. per bushel.

Donald McInnes, of North Branch, Baddeck (C.B.), N.S., had also a yield of 80 lbs. He says: "Sown 28th May, on rich deep soil; size of plot, about 2 square rods; harvested 12th September." The sample returned weighed 65½ lbs. per bushel.

Denis Côté, of La Baie, Que., reports a yield of 216 lbs. from 3 lbs. of seed. He says: "Sown 30th April, on strong heavy soil; size of plot, 12 perches; sown very thin; harvested 15th August; much earlier than varieties here." No sample was returned in this case.

George Myrand, St. Foy, Que., had a crop of 180 lbs., and says: "Sown 8th May, on loamy soil; size of plot, 20 x 90 feet; harvested 28th August; straw long and excellent. I prefer these to any other variety." The sample returned weighed 66¼ lbs. per bushel.

Wm. Dunn, of Sweet's Corners, Ont., had a crop of 214 lbs., and says: "Sown 1st May, on clay land; size of plot, 26 x 87 feet; no manure used; harvested 14th August; straw short, and well loaded with pods." I think these peas will do well here. The weight of the sample returned was 64½ lbs. per bushel.

J. C. Duhame, of Crysler, Ont., harvested 185 lbs. He says: "Sown 15th May, on yellow clay soil; harvested 15th September." No sample received.

Stephen Thompson, of Beaver Creek, Man., had a crop of 58 lbs. He says: "Sown 6th May, on sandy loam; size of plot, 5 x 100 feet; harvested 16th September; the spring was dry and unfavourable for this crop." The sample returned weighed 66 lbs. per bushel.

D. Berger, Langenberg, N.-W.T., had a yield of 90 lbs., and says: "Sown 16th April, on sandy loam; size of plot, 10 x 30 feet; harvested 20th August; has done better than other sorts grown here." The weight of the sample returned was 64½ lbs. per bushel.

Indian Corn.

Most of the samples of corn referred to in the list of grain sent out were distributed by J. A. Robertson, Agriculturist of the Experimental Farm and Dairy Commissioner of the Dominion, during a visit paid by him to the Maritime Provinces in June last. Sample bags containing 3 or 4 pounds each were given to any farmers present at the meetings which he attended who were willing to test the value of corn for fodder purposes.

F. G. Borger, of Georgetown, P.E.I., writes on 13th October, 1891: "The fodder corn I got from you is a real success; good judges put the crop at over 20 tons to the acre."

Cyrus Shaw, of New Perth, P.E.I, writes, 5th December: "I take this opportunity of bearing testimony to the success of the corn distributed by you last spring, in our neighbourhood; the result is all that could be desired. I intend to plant 2 acres next spring."

John Hamilton, of New Perth, P.E.I., says: "Your corn has exceeded our expectations and may become one of our staple crops in future. Next year the planting of fodder corn will be undertaken here on a large scale."

Benjamin Murray, of Bedeque, P.E.I., "planted the contents of the sample bag he received on the 12th June, and by careful hand-planting it was sufficient for six rows, each 4 chains in length. It was cut on the 10th October and was an excellent crop." He intends growing corn extensively next year.

Similar experience has been had in Nova Scotia.

Potatoes.

A limited distribution of potatoes was made in small bags containing 3 lbs. each, and quite a number of encouraging reports have been received, of which the following are examples:—

Chicago Market.

J. C. McNair of Perth Centre, N.B., received a sample bag of 3 lbs., from which he had a crop of 120 lbs. He says: "Planted 5th June, on light soil; harvested 10th October; earlier and better weight than other potatoes; am well pleased with the variety."

P. Fortien, of St. Fabien, Que., had a yield of 145 lbs. He says: "Planted 1st June, on yellow soil, dressed with manure; harvested 25th September. These potatoes are the finest of this year's harvest."

Joseph Marcott, of St. Albans, Que., had 83 lbs., and writes: "Planted 1st June, on grey soil; harvested 22nd September."

Thomas Bradley, of Minden, Ont., had a crop of 105 lbs. He says: "Planted 29th May, on sandy loam; harvested 15th October. These yielded about the same as the Rose."

Early Ohio.

R. R. Colpitts, of Forest Glen, N.B., had a crop of 50 lbs. He says: "Planted 25th May, on intervale loam; harvested 4th October; they had not a fair chance; soon after they came up the potato beetle almost destroyed them."

D. V. Gagné, of Sturgeon Falls, Ont., had a yield of 103 lbs., and writes: "Planted 28th May, on yellow soil manured; harvested 4th September; they are not as early as Early Rose but give double the yield here."

S. J. Ryan, of Head Lake, Ont., had 75 lbs., and says: "Planted 1st June, on rich clay loam; harvested 1st September; ripe two weeks earlier than Early Rose and fully double the yield."

Early Sunrise.

Phileas Fortien, of St. Fabien, Que., reports a yield of 120 lbs. from 3 lbs. received, and says: "Planted 30th May, on rich yellow soil; harvested 28th September. These potatoes are very good, are as early as Early Rose and promise well."

T. J. Amey, of Camden East, Ont., had a crop of 106 lbs., and says: "Planted 21st May on clay loam." The date of harvesting is not given.

Wm. Holmes, of Kirkfield, Ont., had a yield of 100 lbs. He says: "Planted 15th May, on clay loam; harvested 23rd September; they did better than any other sort we planted."

DISTRIBUTION OF FALL WHEAT.

CANADIAN VELVET CHAFF.

Early in the autum of 1890 there was distributed in those districts of Ontario where fall wheat is successfully grown 519 3-lb. samples of the Canadian Velvet Chaff, a very promising variety of fall wheat. This wheat was tested at several points in Ontario, during 1890, and turned out remarkably well. It is a fine plump wheat and a heavy cropper. A large number of excellent reports have been received from the farmers to whom the samples were sent, from which the following have been selected :—

T. S. Brant, of Whitby, had a crop of 330 lbs. from 3 lbs. of seed, and says: "Sown broadcast 20th Sept., 1890, on clay loam, after barley; size of plot, $\frac{1}{10}$ acre; harvested 20th August, 1891; no smut or rust; straw stiff and bright; hardly so early as other varieties, but gives a better yield. I have sown the yield of the 3 lbs. sent on five acres." The weight of the sample returned was $60\frac{1}{4}$ lbs. per bushel.

Thos. Harris, of Hagersville, had a yield of 299 lbs. from 3 lbs. of seed. He says: "Sown broadcast 12th September, 1890, on sandy loam; size of plot, $\frac{1}{8}$ of an acre; harvested 17th July, 1891; no rust; a few grains of smut; straw rather coarse and soft; a day or two later than other varieties." The weight of the sample returned was 62 lbs. to the bushel.

John Grooms, of Bothwell, had 270 lbs. He says: "Sown broadcast 9th September, 1890, on clay loam; size of plot, 44 x 115 feet; harvested 19th July, 1891;

no rust or smut; straw coarse and of medium length; some 3 or 4 days later than the Scott wheat, but far superior." The sample returned weighed 61 lbs. per bushel.

Mark Crawford, of Whitby, had a crop of 251 lbs. from 3 lbs. of seed. He says: "Sown in drills 9th September, 1890, on strong clay land; size of plot, $\frac{1}{11}$ of an acre; harvested 25th July, 1891; no rust; no smut; straw medium, with very large head; was fully as early as any other sorts grown in this locality; am very much pleased with the wheat; it stood the winter well, started early in the spring and produced a heavy crop." The weight of this sample was $62\frac{3}{4}$ lbs. per bushel.

Samuel Alton, of Belfast, also had a yield of 251 lbs., and says: "Sown broadcast 10th or 12th Sept., on clay loam; size of plot, $\frac{1}{17}$ of an acre,; harvested 23rd July, 1891; no rust; some smut; straw bright and soft; was ripe as soon as the Star and Democrat, sown 10 or 12 days earlier; the yield was immense." The sample returned weighed 62 lbs. to the bushel.

Welcome Marr, of Glanford Station, had 186 lbs., and says: "Sown broadcast 8th Sept., 1890, on clay loam; size of plot, 6 x 60 yards; harvested 24th July, 1891; some rust; no smut; straw much like Clawson; four days later than Clawson or Golden Cross." The sample returned weighed 61 lbs. per bushel.

George H. Thompson, of Guelph, had a yield of 156 lbs. He says: "Sown in drills 9th Sept., 1890, on clay loam; size of plot, $\frac{1}{20}$ of an acre; harvested 28th July, 1891; no sign of rust; slightly affected with smut; straw bright, standing well; compares very favourably with other sorts; I think it will do well in this section." Sample returned weighed $61\frac{3}{4}$ lbs.

V. E. Kincade, of Wisbeach, had a crop of 151 lbs., and reports as follows: "Sown broadcast Sept., 1890, on light clay soil, mixed with gravel; size of plot, $1\frac{1}{2}$ x 7 rods; harvested 21st July, 1891; no rust, but a large quantity of smut; straw bright, long and strong; compares favourably with other sorts grown by me." The weight of the sample returned was $58\frac{3}{4}$ lbs. per bushel.

EXPERIMENTS WITH OATS.

During the season of 1891 forty-eight varieties of oats have been tested on the Central Experimental Farm, 29 of which have been grown in field crops, the remainder in small plots, chiefly in plots of $\frac{1}{20}$ of an acre each. Thirty-six varieties were sown side by side, all on the same day, on plots of $\frac{1}{20}$ of an acre. The land used for this purpose was the same as that used for the $\frac{1}{10}$ acre plots in 1890. This field was ploughed in the autumn of 1890, and manured in the spring of 1891, with about twenty two-horse loads of stable manure to the acre.

This was spread in the spring, lightly ploughed under and the land harrowed before sowing. These plots were arranged so as to have the oats follow wheat. These were all sown on the 28th of April, on sandy loam with a clay subsoil, but many of them rusted badly, which lessened the crops and reduced the weight per bushel very much, and caused the grain to ripen prematurely, so that the normal dates of ripening could not be accurately determined. For this reason the time of harvesting and the number of days maturing have been omitted.

Test of Varieties of Oats, all sown same day.

—	Yield per Acre.		Weight per Bushel.
	Bush.	lbs.	Lbs.
American Beauty	30	03	23½
American Triumph	21	14	
Bonanza	23	30	29
Banner	37	14	23¼
Badger Queen	27	29	31½
Black Tartarian	22	..	21
" Prolific (Webb's)	20	33	20½
Challenge White Canadian	24	14	27¼
Canadian Triumph	31	28	39
Cream Egyptian	57	12	34½
Early Archangel	33	13	36¾
Early Race-horse	36	24	33¼
Early Blossom	38	18	26½
English Potato	38	08	28¼
Flying Scotchman	48	26	32
Giant White Side	21	24	19
Hazlett's Seizure	11	06	27
Holstein Prolific	45	..	26¾
Hungarian White	30	28	34
Georgia Early White	32	32	31½
Longfellow	42	..	30½
New Zealand	14	29	36½
Oderbruch	29	32	30½
Prize Cluster	28	28	27¾
Rennie's Prize White	25	13	29¾
Rosedale	27	32	27¾
Siberian	34	02	32½
Victoria Prize	18	33	30
Wide Awake	24	16	24
White Russian	15	12	32¼
Welcome	37	30	34
White Dutch	32	32	33¾
White Giant	36	24	24½
Waterloo	37	15	24¼
White Egyptian	49	32	29¾
English White	21	08	32½

This list cannot be taken as a fair index of the fertility and quality of the different varieties, but since most of the plots were subject to the same unfavourable conditions, it was thought best to publish this comparative table. The field plots which follow, not having suffered so much with rust, make a much better showing and are more reliable as regards the comparative value of the different sorts.

LARGER FIELD PLOTS.

When the words "no manure" are used in the following records, it should be understood to mean that no manure has been applied to the lands spoken of since the experimental farm was purchased in 1887. We have no records of the treatment of such portions of the land as were under cultivation prior to this. When the word "manure" is used it means an application of about twenty two-horse loads per acre. Where reference is made to the preparation of the soil, it should be understood that in all cases where the disc harrow is used that it is followed with the ordinary toothed or smoothing harrow run crosswise before the grain is sown.

Banner.—On light sandy soil; manured in the spring of 1890; ploughed in the autumn of 1890, and disc harrowed in the spring of 1891; seven acres; sown 2nd May; 2¼ bushels per acre; ripe 15th August; time to mature, 105 days; yield per acre, 44 bushels 31 lbs.; weight per bushel, 36¼ lbs. Oat long, white; length of

panicle, 6 to 7 inches; straw, 3 feet high, bright, with scarcely any rust. The crop in this instance would have shown a larger result, but for a hail storm, which threshed a portion of the grain out while in stook.

Bonanza.—On sandy loam; manured in the spring of 1890; ploughed in the autumn of 1890, and disc harrowed in the spring of 1891; $5\frac{1}{2}$ acres; sown 4th May; $1\frac{3}{4}$ bushels per acre; ripe 5th August; time to mature, 93 days; yield per acre, 39 bushels 28 lbs.; weight per bushel, $42\frac{1}{4}$ lbs.; oat short, plump, white; length of panicle, 8 to $8\frac{1}{2}$ inches; straw not strong or coarse, but standing well, 3 to $3\frac{1}{4}$ feet long; considerably rusted.

Canadian White.—On light sandy loam; manured in the spring of 1890; ploughed in the autumn of 1890, and disc harrowed in the spring of 1891; 2 acres; sown 24th April; 2 bushels per acre; ripe 18th August; time to mature, 116 days; yield per acre, 52 bushels 2 lbs., weighing 39 lbs. per bushel; oat long, not very plump, white; length of panicle, 8 to 9 inches; straw, 3 to $3\frac{1}{2}$ feet long; slightly rusted but standing well.

Challenge White Canadian (Webb's).—On clay loam; land ploughed in the autumn of 1890; manured in the spring of 1891, when it was ploughed again and harrowed; half an acre; sown 29th April; $1\frac{3}{4}$ bushels per acre; ripe 3rd August; time to mature, 96 days; yield per acre, 34 bushels 12 lbs.; weight per bushel, 33 lbs.; length of panicle, 8 to 10 inches; branching; length of straw, $4\frac{1}{2}$ to $4\frac{3}{4}$ feet; badly lodged, and so badly rusted that it ripened prematurely.

Cream Egyptian.—On soil partly sandy, partly peat; no manure; fourth crop since clearing; ploughed in the autumn of 1890; disc harrowed in the spring of 1891; $2\frac{1}{2}$ acres; sown 4th May; $1\frac{3}{4}$ bushels per acre; ripe 17th August; time to mature, 105 days; yield per acre, 43 bushels 31 lbs.; weight per bushel, $38\frac{1}{4}$ lbs.; oat of medium length, fairly plump, white; length of panicle, 8 to 9 inches; sided; straw, $3\frac{1}{2}$ to 4 feet long, standing fairly well; two small spots lodged; very slightly rusted.

Early Archangel.—On sandy loam, mixed with clay; no manure; some artificial fertilizer applied in 1889 for potatoes; ploughed in the autumn of 1890; disc harrowed in the spring of 1891; $\frac{3}{4}$ acre; sown 30th April; $1\frac{3}{4}$ bushels per acre; ripe 14th August; time to mature, 106 days; yield per acre, 48 bushels 8 lbs.; weight per bushel, $38\frac{3}{4}$ lbs.; oat of medium length, plump, white; length of panicle, $7\frac{1}{2}$ to 9 inches; branching; straw, $3\frac{1}{2}$ to 4 feet long; bright, with scarcely any rust; stands fairly well.

English Potato.—On sandy loam; manured in the spring of 1890; ploughed in the autumn of 1890; disc harrowed in the spring of 1891; 1 acre; sown 6th May; $1\frac{3}{4}$ bushels per acre; ripe 14th August; time to mature, 100 days; yield per acre, 48 bushels 9 lbs.; weight per bushel, $37\frac{1}{4}$ lbs.; oat short, fairly plump, white; length of panicle, 8 to $8\frac{1}{4}$ inches; sided; straw 4 feet long; lodged considerably; slightly rusted.

Early Race-horse.—On light sandy soil; no manure; this was the 4th crop from clearing; ploughed in the autumn of 1890; disc harrowed in the spring of 1891; 5 acres; sown 8th May; $1\frac{3}{4}$ bushels per acre; ripe 12th August; time to mature, 96 days; yield per acre, 26 bushels 23 lbs.; weight per bushel, $42\frac{1}{4}$ lbs.; oat short, plump, white; length of panicle, 8 to 9 inches; straw, 3 to $3\frac{1}{4}$ feet long, very badly broken by hail and rain; slightly rusted; about one-fourth of the grain was beaten out by a hail storm, which lessens the recorded yield.

Flying Scotchman.—On light sandy soil; no manure; has been cropped for four years; ploughed in the autumn of 1890, and disc harrowed in the spring of 1891; $5\frac{1}{2}$ acres; sown, 8th May; $1\frac{3}{4}$ bushels per acre; ripe, 11th August; time to mature, 95 days; yield per acre, 29 bushels 7 lbs.; oat short to medium in length, plump, white; length of panicle, 8 to 9 inches; branching; straw, 3 to $3\frac{1}{4}$ feet long; badly broken by hail storm, but not lodged, and about one-fourth of the grain threshed out; slightly rusted; land very poor and sandy.

Georgia Early White.—On light sandy loam; manured in the spring of 1890; ploughed in the autumn of 1890; disc harrowed in the spring of 1891; $1\frac{1}{3}$ acres; sown 24th of April; $1\frac{3}{4}$ bushels per acre; ripe 10th August, time to mature, 108

days; yield per acre, 42 bushels 29 lbs.; weight per bushel, 41 lbs.; oat of medium length, plump, white; length of panicle, $8\frac{1}{2}$ to $9\frac{1}{4}$ inches; branching; straw $3\frac{1}{2}$ to 4 feet long, standing fairly well; lodged at one end; slightly rusted.

Giant Swedish.—On sandy loam mixed with clay; no manure; artificial fertilizer applied in 1889 for potatoes; ploughed in the autumn of 1890 and disc harrowed in the spring of 1891; one acre; sown 30th of April; 2 bushels per acre; ripe 23rd August; time to mature, 115 days; yield per acre, 67 bushels 26 lbs.; weight per bushel, $32\frac{3}{4}$ lbs.; oat long, fairly plump, yellow; length of panicle, 9 to 10 inches; sided; straw 4 to $4\frac{1}{2}$ feet long, bright, free from rust and all standing.

Golden Beauty (Pearce).—On sandy loam, mixed with clay; no manure; artificial fertilizer applied in 1889 for potatoes; ploughed in the autumn of 1890 and disc harrowed in the spring of 1891; $\frac{1}{3}$ acre; sown 30th April; $1\frac{3}{4}$ bushels per acre; ripe 12th August; time to mature, 110 days; yield per acre, 64 bushels 32 lbs.; weight per bushel, 35 lbs.; oat medium to long, pale yellow; length of panicle, 7 to 8 inches; branching; straw 4 feet long, rather dark in colour; considerably rusted but standing fairly well.

Hazlett's Seizure.—Soil and preparation same as Golden Beauty; $\frac{3}{4}$ acre; sown 30th April; $1\frac{3}{4}$ bushels per acre; ripe 8th August; time to mature, 100 days; yield per acre, 44 bushels 14 lbs.; weight per bushel, 42 lbs.; oat short, plump; length of panicle, 7 to 8 inches; branching; straw, 3 to $3\frac{3}{4}$ feet long, rather weak; partly broken down about 1 foot from base; slightly rusted.

Holstein Prolific.—Soil and preparation same as Golden Beauty; $\frac{4}{5}$ acre; sown 30th April; 2 bushels per acre; ripe 11th August; time to mature, 103 days; yield per acre, 51 bushels 30 lbs.; weight per bushel, 35 lbs.; oat long, plump, pale yellow; length of panicle, 7 to 8 inches; branching; straw, 3 to $3\frac{1}{2}$ feet long; standing fairly well; very slightly rusted.

Hungarian White.—Soil and preparation same as Golden Beauty; $\frac{1}{2}$ acre; sown 30th April; $1\frac{3}{4}$ bushels per acre; ripe 25th August; time to mature, 117 days; yield per acre, 65 bushels 8 lbs.; weight per bushel, $30\frac{3}{4}$ lbs.; oat medium length, rather thin, white; length of panicle, 8 to 9 inches; branching; straw, $3\frac{1}{2}$ to $3\frac{3}{4}$ feet long; standing well; slightly rusted; some grain beaten out by storm.

Longfellow.—On light, sandy soil; manured in the spring of 1890; ploughed in the autumn of 1890 and disc harrowed in the spring of 1891; $1\frac{1}{3}$ acres; sown 6th May; $1\frac{3}{4}$ bushels per acre; ripe 17th August; time to mature, 103 days; yield per acre, 33 bushels 30 lbs.; weight per bushel, $33\frac{1}{4}$ lbs.; oat small size, black, keeps its colour well; length of panicle, 5 to 6 inches; branching; straw, $2\frac{1}{4}$ to $2\frac{1}{2}$ feet long; all standing; no rust; grain considerably beaten out by hail.

Oderbruch.—On soil partly sandy and partly clay loam; no manure; 4th crop; ploughed in the autumn of 1890 and disc harrowed in the spring of 1891; $1\frac{1}{6}$ acres; sown 16th May; $1\frac{3}{4}$ bushels per acre; ripe 20th August; time to mature, 96 days; yield per acre, 84 bushels 33 lbs.; weight per bushel, 29 lbs.; oat medium length, fairly plump, white; length of panicle, 8 to 9 inches; half-sided or sided; straw 4 to $4\frac{1}{2}$ feet long, standing fairly well; considerably rusted but very promising.

Poland White.—On light sandy loam; manured in the spring of 1890; ploughed in the autumn of 1890 and disc harrowed in the spring of 1891; $1\frac{3}{4}$ acres; sown 24th April; $1\frac{3}{4}$ bushels per acre; ripe, 10th August; time to mature, 108 days; yield per acre, 49 bushels 8 lbs.; weight per bushel, 34 lbs.; oat short, plump, white; length of panicle, 8 to 9 inches; branching; straw, $3\frac{1}{2}$ to 4 feet long; considerably lodged and slightly rusted.

Prize Cluster.—On sandy loam; part of this field was manured in the spring of 1889, the remainder in the spring of 1891; ploughed in the autumn of 1890; that part manured in 1889 was disc harrowed in the spring of 1891; the recently manured portion ploughed and harrowed; $11\frac{3}{4}$ acres; sown 30th April; $1\frac{3}{4}$ bushels per acre; ripe 8th August; time to mature, 100 days; yield per acre, 48 bushels 24 lbs.; weight per bushel, $43\frac{1}{4}$ lbs. About one-fourth of this grain was beaten out while in stook by a hail storm, otherwise the recorded yield would have been larger. Oat short, plump, white; length of panicle, 7 to 8 inches; branching; straw $3\frac{1}{2}$ to 4 feet long; standing fairly well; lodged very slightly in spots; not much rust.

Rosedale.—On sandy loam mixed with clay; no manure; artificial fertilizer applied in 1889 for potatoes; ploughed in the autumn of 1890; disc harrowed in the spring of 1891; half an acre sown 30th April, $1\frac{3}{4}$ bushels per acre; ripe 10th August; time to mature, 102 days; yield per acre, 83 bushels 6 lbs.; weight per bushel, $37\frac{3}{4}$ lbs.; oat short to medium, plump and white; length of panicle, 8 to $8\frac{1}{2}$ inches; sided or slightly branching; straw $3\frac{1}{2}$ to 4 feet long, standing fairly well; lodged in a few spots only; almost free from rust.

Rennie's Prize White.—On soil part sandy loam, part peaty; manured in the spring of 1890; ploughed in the autumn of 1890 and disc harrowed in the spring of 1891; $3\frac{1}{5}$ acres; sown 6th May, $1\frac{3}{4}$ bushels per acre; ripe 5th August; time to mature, 92 days; yield per acre, 39 bushels 23 lbs.; weight per bushel, 42 lbs.; oat short, plump and white, much like Prize Cluster; length of panicle, 8 inches, branching; straw, $3\frac{1}{2}$ feet long; slightly rusted.

Triumph Canadian.—On sandy loam; no manure; ploughed in the autumn of 1890 and again lightly in the spring of 1891 and harrowed; 2 acres; sown 29th April, $1\frac{3}{4}$ bushels per acre; ripe 3rd August; time to mature, 96 days; yield per acre, 18 bushels 15 lbs.; weight per bushel, $39\frac{1}{4}$ lbs.; oat short, plump and white; length of panicle, 9 to 10 inches, branching; straw 4 to $4\frac{1}{2}$ feet; rusted very badly and on this account ripened prematurely.

Triumph American.—On soil partly sandy and part clay loam; no manure; fourth crop; ploughed in the autumn of 1890; disc harrowed in the spring of 1891; 6 acres; sown 16th May, 2 bushels per acre; ripe 23rd August; time to mature, 99 days; yield per acre, 37 bushels 16 lbs.; weight per bushel, $34\frac{1}{4}$ lbs.; oat short, fairly plump and white; length of panicle, 7 to 8 inches, branching; straw 4 feet long; slightly rusted; lodged.

Tartarian Prolific Black (Webb's).—On clay loam, manured in the spring of 1891; ploughed in the autumn of 1890 and ploughed again and harrowed in the spring of 1891; two thirds of an acre; sown 29th April, 2 bushels per acre; ripe 11th August; time to mature, 104 days; yield per acre, 38 bushels 3 lbs.; weight per bushel, $33\frac{3}{4}$ lbs.; oat long, not plump, tawny colour; length of panicle, 7 to 8 inches, sided; straw 4 to $4\frac{1}{2}$ feet long, very weak; much broken about one foot from base; partly lodged; very much rusted.

Tartarian Black.—On light sandy soil, manured in the spring of 1890; ploughed in the autumn of 1890 and disc harrowed in the spring of 1891; $1\frac{1}{3}$ acres; sown 6th May, $1\frac{3}{4}$ bushels per acre; ripe 15th August; time to mature, 101 days; yield per acre, 38 bushels 26 lbs.; weight per bushel, $33\frac{3}{4}$ lbs.; oat long, tawny to black; length of panicle, 6 to 7 inches, sided; straw 3 to $3\frac{1}{4}$ feet long, standing well; no rust; grain partly threshed out by hail.

Victoria Prize White.—On sandy loam mixed with clay, manured in the spring of 1890; ploughed in the autumn of 1890; disc harrowed in the spring of 1891; 6 acres; sown 2nd May, $1\frac{3}{4}$ bushels per acre; ripe 7th August; time to mature, 97 days; yield per acre, 26 bushels 29 lbs.; weight per bushel, $39\frac{3}{4}$ lbs.; oat short, plump and white, closely resembling Prize Cluster; length of panicle, 8 inches, branching; straw $3\frac{1}{2}$ feet long, standing fairly well; one end of field lodged; very little rust.

Welcome.—On soil part sandy and part peaty; no manure; fourth crop from clearing; ploughed in the autumn of 1890; disc harrowed in the spring of 1891; $1\frac{1}{4}$ acres; sown 4th May, $1\frac{3}{4}$ bushels per acre; ripe 5th August; time to mature, 93 days; yield per acre, 53 bushels 9 lbs.; weight per bushel, 37 lbs.; oat short, plump, white; length of panicle, 8 to $8\frac{1}{2}$ inches, branching; straw $3\frac{1}{4}$ to $3\frac{1}{2}$ feet long; more or less rusted; standing well.

White Russian.—Soil and preparation same as Welcome; 3 acres; sown 4th May, $1\frac{3}{4}$ bushels per acre; ripe 19th August; time to mature, 107 days; yield per acre, 37 bushels 31 lbs.; weight per bushel, 38 lbs.; oat long, fairly plump, whitish yellow; length of panicle. 8 to 9 inches, sided; straw 3 to 4 feet long, partly lodged and slightly rusted.

ADDITIONAL SMALL PLOTS OF OATS.

The seed of the following varieties was obtained in the spring of 1891 from Vilmorin, Andrieux & Co., the well-known seedsmen of Paris, France. They were all sown on sandy loam; the land where the first four plots were sown was manured in 1890; the others were manured in 1889; all were ploughed in the autumn of 1890 and disc harrowed twice in the spring of 1891.

Early Etampes.—Size of plot, 49 x 132 feet. Sown 6th May, 1¾ bushels per acre; ripe 27th August; time to mature, 113 days; yield per acre, 37 bushels 22 lbs.; weight per bushel 30 lbs.; oat medium to long, not very plump, black; length of panicle, 8 inches, branching; mixed with a considerable proportion of sided oats; straw 3½ to 4 feet long, thin and weak; considerably lodged; slightly rusted.

Californian Prolific Black.—Size of plot, 43 x 132 feet; sown 6th May, 1¾ bushels per acre; ripe 25th August; time to mature, 111 days; yield per acre, 44 bushels 31 lbs.; considerably threshed out by hail storm; weight per bushel, 26½ lbs.; oat medium length, slender, tawny; length of panicle, 11 inches, sided; straw coarse, considerably lodged and more or less rusted, but promising.

Black Coulommiers.—Size of plot, 37 x 132 feet; sown 6th May, 1¾ bushels per acre; ripe 25th August; time to mature, 111 days; yield per acre, 48 bushels 27 lbs.; oat short, plump, black; panicle branching.

Joanette.—Size of plot, 60 x 132 feet. Sown 6th May, 1¾ bushels per acre; ripe 25th August; time to mature, 111 days; yield per acre, 56 bushels 26 lbs.; weight per bushel, 31¼ lbs.; oat medium to long, tawny to black; length of panicle, 7 to 8 inches, branching; straw 4 to 4¼ feet long, rather thin; badly lodged and slightly rusted.

Abundance.—Size of plot, 12 x 590 feet. Sown 6th May, 1¾ bushels per acre; ripe 18th August; time to mature, 104 days; yield per acre, 64 bushels 27 lbs.; weight per bushel, 30¼ lbs.; oat long, rather slender, yellowish white; length of panicle, 8½ to 9 inches, branching; straw 4½ feet long, strong; stands well; slightly lodged at one end; very slightly rusted.

Black Brie.—Size of plot, 12 x 590 feet. Sown 6th May, 1¾ bushels per acre; ripe 25th August; time to mature, 111 days; yield per acre, 45 bushels 33 lbs.; weight per bushel, 21½ lbs.; oat medium to long, slender, tawny to black; length of panicle, 12 inches, branching; straw 5 feet long; considerably rusted.

Improved Ligowo.—Size of plot, 24 x 590 feet. Sown 6th May, 1¾ bushels per acre; ripe 19th August; time to mature, 105 days; yield per acre, 55 bushels 10 lbs.; weight per bushel, 34½ lbs.; oat medium to long, plump, white; length of panicle, 8½ inches, branching; straw 4½ feet long, standing well, but considerably rusted.

Giant Cluster.—Size of plot, 12 x 490 feet. Sown 6th May, 1¾ bushels per acre; ripe 24th August; time to mature, 110 days; yield per acre, 62 bushels 33 lbs.; weight per bushel, 23½ lbs.; oat long, rather slender, deep yellow; length of panicle, 11½ inches, sided; straw 4 feet long, stiff; did not lodge; very little rust.

Small quantities of the following varieties were also tested:—

Early Gothland.—Two pounds of these oats sent by Steele Bros., of Toronto, for test, were sown on 30th April, on sandy loam; size of plot, 22 x 60 feet. Shortly after sowing a considerable portion of the seed was blown out by a heavy wind, which will probably account for the light crop; ripe 27th August; time to mature, 119 days; yield, 24 lbs.; oat short to medium, white; length of panicle, 9 to 10 inches, sided; straw 3 feet 8 inches to 4 feet 10 inches long; considerably rusted, but standing well.

Black Bourbonnaire, from P. Delorme, Ohlen, N.W.T.; 1½ lbs. was sown 1st May; ripe 27th August; time to mature, 118 days; yield, 52 lbs.; oat medium length, slender, tawny to black; length of panicle, 7 to 8 inches, branching; straw 3 feet 9 inches to 4 feet long, thin; slightly lodged and slightly rusted.

Scottish Chief.—Seven ounces of these oats were received from Mr. W. T. Hyman, of London, Ont.; they were sown 30th April; ripe 9th August; time to mature, 101 days; yield, 20 lbs.; weight per bushel, 39½ lbs.; oat short to medium, plump, white; length of panicle, 10 inches, branching; straw 4 to 4½ feet long; lodged badly, and considerably rusted.

EXPERIMENTS WITH BARLEY.

TWO-ROWED VARIETIES.

Adjoining the one-twentieth acre plots of oats was a similar series of plots of barley, all sown the same day. The particulars as to the character of the soil and its preparation are given under "Experiments with Oats." The barley plots consisted of 26 two-rowed varieties and 19 six-rowed; in rotation of crop they followed oats.

TEST of Varieties of Barley, all sown same day.

Varieties.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Yield per Acre.		Weight per Bushel.
				Bush.	Lbs.	Lbs.
Beardless	April 28	Aug. 11	105	34	28	51¾
Besthorns	do 28	do 12	106	46	28	53
Duckbill	do 28	do 6	100	....	....	52¼
Danish Chevalier	do 28	do 11	105	41	40	52
Danish Printice Chevalier	do 28	do 12	106	49	30	52¼
Dutch	do 28	do 7	101	41	44	52
Early Minting	do 28	do 10	104	42	24	52
Goldthorpe (resembles Duckbill)	do 28	do 13	107	49	28	52¾
Golden Melon	do 28	do 11	105	43	40	52¾
Italian (resembles Duckbill)	do 28	do 5	99	49	36	51¾
Kinver Chevalier	do 28	do 12	106	42	36	52½
Golden Grains (Webb)	do 28	do 12	106	32	32	53¼
New Zealand	do 28	do 6	100	42	04	52¾
Odessa (two-rowed)	do 28	July 31	94	31	10	53¼
Prize Prolific	do 28	Aug. 12	106	33	18	53
Peacock (resembles Duckbill)	do 28	do 9	103	43	20	52½
Peerless White	do 28	do 11	105	37	2	52¼
Prolific	do 28	do 6	100	38	10	53¼
Phœnix Von Thalen	do 28	do 4	98	54	32	53½
Rice or Fan	do 28	do 4	98	34	20	49¾
Saale	do 28	do 12	106	47	20	51
Selected Chevalier	do 28	do 8	102	41	24	52¼
Sharpe's Improved Chevalier	do 28	do 9	103	43	16	52¼
Swedish	do 28	do 10	104	48	16	53¼
Thanet	do 28	do 9	103	41	40	52¼
Large Two-rowed Naked	do 28	do 3	97	27	26	60¼

The Duckbill barley was, unfortunately, lost after threshing, before it was weighed; hence we have no record of the yield of that variety. The Duckbill, Goldthorpe, Italian and Peacock resemble each other very much. They have the heads nearly erect, like wheat, and usually stand up well. The Rice or Fan has a similar habit, but the head is short and spreading. All the other sorts are of the Chevalier type, with long pendant heads, for which reason they are more liable to lodge.

Larger Field Plots.

Danish Chevalier.—On sandy loam mixed with clay; manured in the spring of 1890; sown with peas and ploughed under in 1890; ploughed again in the autumn of 1890, and disc harrowed in the spring of 1891; 2¾ acres; sown 1st May, 2 bushels per acre; ripe 12th August; time to mature, 103 days; yield per acre, 43 bushels 41 lbs.; weight per bushel, 49½ lbs.; length of head, 3½ to 4 inches; straw 2½ to 3 feet long, standing fairly well.

Danish Printice Chevalier.—On sandy loam mixed with peat; manured in the spring of 1890; ploughed in the autumn of 1890 and disc harrowed in the spring of 1891; ⅓ acre; sown 1st May, 2 bushels per acre; ripe 18th August; time

to mature, 109 days; yield per acre, 29 bushels 10 lbs.; weight per bushel, 48¾ lbs.; length of head, 4 inches; straw 2¾ to 3 feet, all standing very well. This plot was rather low in spots and was badly injured by frost in the spring.

Duckbill.—On sandy loam; manured in the spring of 1888; 1/9 acre; sown 21st April, 1¾ bushels per acre; ripe 6th August; time of maturing, 107 days; yield per acre, 69 bushels 27 lbs.; weight per bushel, 51 lbs.; length of head, 2¾ to 3 inches; straw 3 to 4 feet; stands well; slightly lodged in one corner; leaves considerably rusted; stem clean.

Early Minting.—On sandy loam; manured in the spring of 1890; ploughed in the autumn of 1890 and disc harrowed in the spring of 1891; ½ acre; sown 1st May; 2 bushels per acre; ripe 14th August; time to mature, 105 days; yield per acre, 39 bushels 10 lbs.; weight per bushel, 49½ lbs.; length of head, 3½ inches; straw 2½ to 3 feet long, standing fairly well; no rust.

Goldthorpe.—On sandy loam, mixed with clay; a small part of this field manured in the spring of 1890; larger part unmanured; fourth crop; 4½ acres; sown 1st May, 2 bushels per acre; ripe 18th August; time to mature, 109 days; yield per acre, 29 bushels 6 lbs. Land very poor, which will account for small crop. Weight of grain per bushel, 50¼ lbs.; length of head, 3¼ inches; straw 2¼ to 2½ feet long, good and strong; only one spot lodged, all the rest standing; very little rust.

A second plot of 1/9 acre, on a better quality of sandy loam, manured in the spring of 1888, was sown 22nd April; ripe 9th August; time to mature, 109 days; yield per acre, 73 bushels 14 lbs.; weight per bushel. 49¾ lbs.

Golden Melon.—On sandy loam mixed with clay, adjoining Goldthorpe; no manure; 4th crop; ploughed in the autumn of 1890 and disc harrowed in the spring of 1891; 1½ acres; sown 1st May; 2 bushels per acre; ripe 10th August; time to mature, 101 days; yield per acre, 21 bushels 9 lbs.; weight per bushel, 49 lbs.; length of head, 3½ to 4 inches; straw 3¼ to 3½ feet long; considerably broken down but not lodged; very little rust.

Golden Grains (Webb). — On sandy loam mixed with clay. About ¼ of this field was manured in the spring of 1889, remainder no manure; 4th crop; ploughed in the autumn of 1890; disc harrowed in the spring of 1891; ⅔ acres; sown 7th May, 1¾ bushels per acre; ripe 10th August; time to mature, 95 days; yield per acre, 28 bushels 40 lbs.; weight per bushel, 47½ lbs.; length of head, 4 inches; straw 3 to 3¼ feet long, standing fairly well; slightly rusted.

Kinver Chevalier (Webb).—On sandy loam; had a light coating of manure in the spring of 1891, after which it was ploughed and harrowed; 2 acres; sown 24th April, 1½ bushels per acre; ripe 8th August; time to mature, 105 days; yield per acre, 58 bushels 2 lbs.; weight per bushel, 52¼ lbs.; length of head, 4 to 5 inches; straw 3¼ feet long; bright, but badly lodged.

A second field of this variety was sown adjoining Golden Grains, to which the reader is referred for particulars as to soil and preparation; 1¼ acres; sown 7th May, 1¾ bushels per acre; ripe 12th August; time to mature, 97 days; yield per acre, 41 bushels 23 lbs.; weight per bushel, 51½ lbs.; length of head, 3 to 4 inches; straw 2¾ to 3 feet long, standing fairly well; lodged in spots; slightly rusted.

Two acres of similar land adjoining was sown on the same date with the same variety of grain. To this there was applied 400 lbs. per acre of the Royal Canadian fertilizer made by the Nichols Chemical Co., of Capelton, Que. The yield of this field was 56 bushels 10 lbs. per acre; weight per bushel, 51½ lbs.

Prize Prolific.—On clay loam mixed with sand; manured in the autumn of 1887, ploughed in the autumn of 1890, disc harrowed in the spring of 1891; 7½ acres; sown 15th May, 2 bushels per acre, ripe 20th August; time to mature, 97 days; yield per acre, 41 bushels 39 lbs.; weight per bushel, 49¼ lbs.; length of head, 4 to 4½ inches; straw 3 to 3¼ feet long; standing fairly well, but slightly rusted.

A second field of this variety was sown on heavy sandy loam mixed with peat; 2¾ acres; no manure; 4th crop with similar cultivation. The yield in this instance was 34 bushels 36 lbs. per acre.

Selected Chevalier.—On sandy loam; manured in the spring of 1890, ploughed in the autumn of 1890, disc harrowed in the spring of 1891; $\frac{2}{3}$ acre; sown 1st May, 2 bushels per acre; ripe 14th August; time to mature, 105 days; yield per acre, 38 bushels 7 lbs.; weight per bushel, 50 lbs.; length of head, $3\frac{1}{4}$ to $3\frac{3}{4}$ inches; straw $2\frac{1}{2}$ to 3 feet long, standing well; no rust.

SIX-ROWED VARIETIES.

The following were sown on one-twentieth acre plots adjoining those of the two-rowed oats:—

——	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Yield per Acre.		Weight per Bushel.
				Bush.	lbs.	Lbs.
Baxter's six-rowed	April 28	July 26	89	40	00	$51\frac{3}{4}$
Common six-rowed	do 28	do 25	88	46	26	$53\frac{1}{2}$
Guymalaye (hulless)	do 28	Aug. 6	100	45	12	$59\frac{1}{2}$
Greek six-rowed	do 28	do 3	97	24	44	$47\frac{1}{2}$
Hulless Black (hulless)	do 28	July 31	94	34	22	$62\frac{1}{2}$
Kangra Valley	do 28	do 26	89	29	30	$50\frac{1}{4}$
Lahoul (hulless)	do 28	Aug. 10	104	25	04	$58\frac{3}{4}$
Mensury	do 28	July 29	92	45	36	$50\frac{1}{2}$
Moultan	do 28	do 25	88	26	40	$50\frac{3}{4}$
Mardan	do 28	do 25	88	30	26	$51\frac{1}{2}$
Oderbruch	do 28	do 27	90	51	32	$53\frac{1}{4}$
Odessa six-rowed	do 28	Aug. 1	95	43	24	$49\frac{3}{4}$
Palampur	do 28	July 31	94	38	42	$49\frac{3}{4}$
Petschora	do 28	do 23	86	32	14	$47\frac{3}{4}$
Rennie's Improved	do 28	do 27	90	41	32	53
Spiti Valley (hulless)	do 28	do 24	87	22	14	$58\frac{1}{4}$
Sialkot	do 28	do 25	88	34	26	$49\frac{1}{4}$
Simla	do 28	....	....	34	22	$47\frac{1}{2}$
Seoraj	do 28	Aug. 1	95	34	26	$46\frac{1}{4}$

Larger Field Plots.

Baxter's Six-rowed.—On good sandy loam; had a light coat of manure in the spring of 1891, when it was ploughed and harrowed before seeding; $1\frac{1}{7}$ acres; sown 24th April, $1\frac{1}{2}$ bushels per acre; ripe 28th July; time to mature, 95 days; yield per acre, 51 bushels 35 lbs.; weight per bushel, $51\frac{1}{4}$ lbs.; length of head, $2\frac{1}{4}$ to $2\frac{3}{4}$ inches; straw 3 to $3\frac{1}{2}$ feet long, considerably lodged. This barley was much affected with smut.

A second plot of $\frac{1}{20}$ of an acre, on sandy loam, was sown 21st April, $1\frac{3}{4}$ bushels per acre; ripe 29th July; time of maturing, 99 days; yield per acre, 30 bushels 28 lbs.; weight per bushel, 51 lbs.

Rennie's Improved.—Adjoining Baxter's; similar soil and similar treatment; $\frac{1}{8}$ of an acre; sown 24th April, $1\frac{1}{2}$ bushels per acre; ripe 28th July; time to mature, 95 days; yield per acre, 77 bushels 24 lbs.; weight per bushel, 52 lbs.; length of head, 3 to 4 inches; straw 3 feet long; a strong, even growth; slightly lodged at one end.

A second plot of $\frac{1}{20}$ acre on sandy loam; was sown 22nd April, $1\frac{3}{4}$ bushels per acre; ripe 29th July; time of maturing, 98 days; yield per acre, 38 bushels 22 lbs.

Norway House Barley—On sandy loam; $\frac{1}{10}$ acre. Sown 22nd April, $1\frac{3}{4}$ bushels per acre; ripe 23rd July; time of maturing, 92 days; yield per acre, 49 bushels 10 lbs.; weight per bushel, $50\frac{1}{2}$ lbs.; length of head, $2\frac{1}{2}$ inches; straw 3 feet 1 in.; stands well but slightly rusted.

EXPERIMENTS WITH SPRING WHEAT.

Adjoining the $\frac{1}{20}$ acre plots of oats and barley there was a similar group of plots of spring wheat, all sown on the same day. The particulars as to the character of the soil and its preparation are given under experiments with oats. The wheat plots, which consisted of 38 varieties, followed barley.

TEST of Varieties of Spring Wheat, all sown same day.

——	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Yield per Acre.		Weight per Bushel.
				Bush.	lbs.	Lbs.
Australian	April 29	Aug. 13	106	13	22	50
Anglo Canadian	do 29	do 13	106	15	27	54¾
Bearded Red	do 29	do 10	103	28	54	56¾
Calcutta Club (Indian)	do 29	do 4	97	15	12	59½
Calcutta Hard (Indian)	do 29	do 3	96	13	06	58½
Connell White	do 29	do 13	106	30	16	58
Connell Red	do 29	do 14	107	26	39	58¼
Colorado	do 29	do 10	103	27	34	58¼
California White	do 29	do 14	107	18	00	56
Delhi White	do 29	do 11	104	13	41	59
Defiance (Johnston's)	do 29	do 18	111	19	17	57¾
Democrat Spring	do 29	do 20	113	32	19	56¾
Fife Red	do 29	do 14	107	22	35	55¾
Fife White	do 29	do 16	109	26	07	57¼
Fife (Wellmans)	do 29	do 15	108	27	07	57½
Gehun (Indian)	do 29	do 9	102	13	30	57¾
Goose	do 29	do 20	113	33	35	57¼
Great Western	do 29	do 16	109	29	57	59
Green Mountain	do 29	do 14	107	19	19	53¼
Galician Summer	do 29	do 17	110	24	30	56½
Herison's Beardless	do 29	do 13	106	15	48	54
Hungarian Mountain	do 29	do 14	107	24	06	59
Huestons	do 29	do 13	106	25	27	56½
Judket	do 29	do 16	109	25	46	57½
Karachi (Indian)	do 29	do 10	103	8	20	54¾
Kangra Valley (Indian)	do 29	do 10	103	6	25	55½
Ladoga	do 29	do 5	98	21	07	57½
Lahoul (Indian)	do 29	do 6	99	18	47	52¾
Pringle's Champlain	do 29	do 12	105	31	59	57¾
Palampur (Indian)	do 29	do 4	97	18	05	59
Rio Grande	do 29	do 17	110	35	07	59¼
Russian Hard Tag	do 29	do 13	106	30	05	58½
Red Fern	do 29	do 17	110	35	30	58½
Saxonka	do 29	do 11	104	19	13	55½
Triumph (Campbell's)	do 29	do 9	102	15	35	56½
Trimenian Sicilian	do 29	do 18	111	19	33	53¾
White Chaff (Campbell's)	do 29	do 9	102	25	13	56¼
White Russian	do 29	do 13	106	27	59	57½

The weight of the grain in these plots, and in some instances the yield also, was lessened by the prevalence of rust, from which nearly all the varieties suffered more or less.

Larger Field Plots.

Anglo Canadian.—On sandy loam mixed with peat; no manure; fourth crop; ploughed in the autumn of 1890, disc harrowed in the autumn of 1891; ⅔ acre. Sown 2nd May, 1½ bushels per acre; ripe 19th August; time to mature, 109 days. Yield per acre, 20 bushels 42 lbs.; weight per bushel, 57¼ lbs. Length of head, 3½ inches; bearded; straw 3½ to 3¾ feet long, all standing well; slightly rusted.

Judket.—On clay loam; no manure; fifth crop; ploughed in the autumn of 1890, disc harrowed in the spring of 1891; ⅔ acre. Sown 25th April, 1½ bushels per acre; ripe 15th August; time to mature, 112 days; yield per acre, 31 bushels 22 lbs.; weight per bushel, 59 lbs. Length of head, 3 to 3¼ inches; beardless; straw 3½ feet long, standing well; slightly rusted.

Johnston's Defiance.—Soil and treatment the same as Judket; ½ acre. Sown 25th April, 1½ bushels per acre; ripe 14th August; time to mature, 111 days; yield per acre, 45 bushels 21 lbs.; weight per bushel, 59 lbs. Length of head, 3 inches; beardless; straw 3½ feet long, all standing; slightly rusted; a promising variety.

Ladoga.—Soil and treatment the same as Judket; $\frac{3}{7}$ acre. Sown 25th April, 1½ bushels per acre; ripe 7th August; time to mature, 104 days; yield per acre, 28 bushels 32 lbs.; weight per bushel, 59¾ lbs. Length of head, 3 to 3¼ inches, bearded; straw 3½ feet long, standing fairly well; lodged in one spot only; slightly rusted.

Red Connell.—Soil and treatment the same as Judket; $\frac{3}{7}$ acre. Sown 25th April, 1½ bushels per acre; ripe 14th August; time to mature, 111 days; yield per acre, 28 bushels 47 lbs.; weight per bushel, 58¼ lbs. Length of head, about 3 inches, beardless; straw 3 feet long, standing well; slightly rusted.

Rio Grande.—Soil and treatment the same as Judket; 1⅓ acres. Sown 25th April; 1½ bushels per acre; ripe 15th August; time to mature, 112 days; yield per acre, 26 bushels 20 lbs.; weight per bushel, 59½ lbs. Length of head, 3¼ to 4 inches, bearded; straw 3¾ to 4 feet long; strong bright; all standing well; slightly rusted; a promising variety.

Triumph (Campbell's.)—Soil and treatment the same as Judket; 1⅓ acres. Sown 25th April, 1½ bushels per acre; ripe 10th August; time to mature, 107 days; yield per acre, 23 bushels 58 lbs.; weight per bushel, 55¼ lbs. Length of head, 2¾ to 3¼ inches, beardless; straw 3 feet long; considerably rusted.

White Chaff (Campbell's.)—Soil and treatment the same as Judket; 3 acres. Sown 24th April, 1½ bushels per acre; ripe 9th August; time to mature, 107 days; yield per acre, 28 bushels 51 lbs.; weight per bushel, 58 lbs. Length of head, 3½ to 3¾ inches, beardless; straw 3 to 3¼ feet; fairly stiff and standing well; considerably rusted.

White Fife.—Soil and treatment the same as Judket; ½ acre. Sown 25th April; 1½ bushels per acre; ripe 14th August; time to mature, 111 days; yield per acre, 29 bushels 30 lbs.; weight per bushel, 58¾ lbs. Length of head, about 3 inches, beardless; straw 3¼ to 3½ feet long; all standing; slightly rusted.

White Connell.—Soil and treatment the same as Anglo Canadian; ½ acre. Sown 2nd May, 1½ bushels per acre; ripe 20th August; time to mature, 110 days; yield per acre, 21 bushels 39 lbs.; weight per bushel, 57½ lbs. Length of head, about 3 inches, beardless; straw 3 to 3¼ feet long; all standing well; very slightly rusted.

Hard Calcutta (from India).—Soil and treatment the same as Judket; ½ acre. Sown 25th April, 1½ bushels per acre; ripe 5th August; time to mature, 102 days; yield per acre, 14 bushels 33 lbs.; weight per bushel, 60¾ lbs.; length of head, 2 to 2½ inches, bearded; straw 2 to 2¼ feet long; slender, weak growth.

EXPERIMENTS WITH PEAS.

Ten varieties of peas were sown in field plots, all on sandy loam.

Black-eyed Marrowfat.—On sandy loam mixed with clay; manured in the spring of 1890; ploughed in the autumn of 1890; disc harrowed in the spring of 1891; ⅔ acre; sown 23rd April, 4 bushels per acre; ripe 17th August; time to mature, 116 days; yield per acre, 39 bushels 21 lbs.; weight per bushel, 61½ lbs.; vines made a very strong growth.

A second plot of this variety on sandy loam; no manure; 4th crop; ploughed in the autumn of 1890; disc harrowed in the spring of 1891; ¾ acre; sown 27th April; 3½ bushels per acre; when about 3 inches high the plants were entirely eaten

off 24th to 26th May, by cut-worms, but they very soon started a second growth; were ripe 19th August; time to mature, 114 days. This plot yielded 29 bushels 59 lbs. per acre, weighing 61½ lbs. per bushel; strong growth.

Crown.—Soil and treatment the same as second plot of Black-eyed Marrowfats; ½ acre. Sown 27th April, 2½ bushels per acre. This plot also was partly eaten off by cut-worms, 24th to 26th May, but the plants soon started a vigorous second growth; the peas were ripe 16th August; time to mature, 111 days; yield per acre, 47 bushels 11 lbs.; weight per bushel, 62 lbs.; very strong growth.

Daniel O'Rourke.—Soil and treatment the same as second plot of Black-eyed Marrowfat; ⅓ acre. Sown 27th April, 2½ bushels per acre; ripe 3rd August; time to mature, 98 days; yield per acre, 38 bushels 54 lbs.; weight per bushel, 62 lbs.; fair growth.

Mummy.—Soil and treatment the same as second plot of Black-eyed Marrowfats; ⅔ acre. Sown 27th April, 2½ bushels per acre; eaten off by cut-worms, 24th to 26th May; soon started a vigorous second growth; ripe 17th August; time to mature, 111 days; yield per acre, 39 bushels 13 lbs.; weight per bushel, 62¼ lbs.; a very strong growing variety.

Multiplier.—Soil of same character and treatment as second plot of Black-eyed Marrowfats, but a poorer piece of land; 3¾ acres. Sown 27th April, 2½ bushels per acre; ripe 16th August; time to mature, 110 days; yield per acre, 27 bushels 12 lbs.; weight per bushel, 62½ lbs.; a fairly strong-growing sort.

Pride.—Soil and treatment the same as second plot of Black-eyed Marrowfats; ⅔ acre. Sown 27th April, 2½ bushels per acre; completely eaten off by cutworms, 24th to 26th May; a vigorous second growth soon started and the peas were ripe 15th August; time to mature, 109 days; yield per acre, 37 bushels 55 lbs.; weight per bushel, 64¼ lbs.; a strong-growing and promising variety.

Prussian Blue.—Soil and treatment the same as Pride; ½ acre. Sown 27th April, 2½ bushels per acre; also eaten off by cutworms; started a good second growth and ripened 20th August; time to mature, 114 days; yield per acre, 28 bushels 20 lbs.; weight per bushel, 63 lbs.

Prince Albert.—Soil and treatment the same as Pride; ½ acre. Sown 27th April, 2½ bushels per acre; yield per acre, 40 bushels 2 lbs.; not injured by cut-worms; ripe, 17th August; time to mature, 111 days; weight per bushel, 62 lbs.; a strong growing sort.

White Marrowfat.—Soil and treatment the same as Pride; ⅔ acre. Sown 27th April; 3½ bushels per acre; eaten off by cut-worms, 24th to 26th May; ripe 20th August; time to mature, 114 days; yield per acre, 18 bushels 54 lbs., weighing 59 lbs. per bushel; a very strong-growing variety.

Golden Vine.—Soil and treatment the same as Pride; ½ acre. Sown 27th April, 2½ bushels per acre; not injured by cut-worms; ripe 17th August; time to mature, 111 days; yield per acre, 44 bushels 7 lbs.; weight per bushel, 63¼ lbs.

EXPERIMENTS WITH TURNIPS.

The turnips grown on the experimental plots during 1891 were very much injured by a species of rot, which was very prevalent in the neighbourhood of Ottawa. Some varieties were affected more than others, but the injury was very general and resulted in the destruction of a large proportion of the crop. As it is impossible, under such circumstances, to give correct returns of the relative yield of the different sorts, the results of this crop are omitted as far as the experimental plots are concerned. Some particulars will be found regarding the crop obtained on some of the field plots in the 40 acres reported on by the agriculturist.

EXPERIMENTS WITH MANGELS.

Fifteen varieties of mangels were sown in rows 2½ feet apart, and cultivated with a horse cultivator. The soil was sandy loam, manured in 1888, dressed with a coating of unleached ashes; 150 bushels to the acre, in 1889, and 400 lbs. per acre,

in 1891, of Royal Canadian fertilizer. There were two series of plots; the first was sown on the 8th of May, the second on the 18th, and both were pulled on 15th and 16th October. The yield per acre has been calculated from the crop of three rows, each 66 feet long. As stated in the report for 1891, estimates based on the returns from small plots usually show a relatively greater yield than when founded on the results of larger areas, but since all the varieties were treated alike and the soil was very similar throughout, these figures form a fair basis for the comparison of varieties. In this instance, quite a number of the plots were injured, and some of them entirely destroyed by cut-worms. On this account the records are incomplete; only two of the varieties named in the second series are found in the first.

—	Yield per Acre.		Yield per Acre.	
First Series of Plots, Sown 8th May.	Tons.	lbs.	Bush.	lbs.
Mammoth Yellow Intermediate	32	20	1,067	
Mammoth Long Red or Gatepost	30	720	1,012	
Mammoth Long Red	30	324	1,005	24
Kinver Yellow Globe	28	496	941	36
Mammoth Long Red	27	252	904	12
Yellow Flesh Tankard	26	1,328	888	48
Golden Flesh Tankard	22	1,672	761	12
Giant Yellow Globe	21	1,560	726	
Yellow Intermediate or Ovoid	21	1,296	721	36
New Giant Yellow Intermediate	20	1,712	695	12
Mammoth Long Red Selected	20	392	673	12
Second Series of Plots, Sown 8th May.				
Yellow Intermediate	29	1,796	996	36
Mammoth Long Red	26	8	866	43
Champion Yellow Globe	25	1,612	860	12
Golden Tankard	25	1,612	860	12
Kinver Yellow Globe	23	1,652	794	12
New Giant Yellow Intermediate	22	1,804	763	24
Golden Tankard	22	1,540	759	
Golden Tankard	22	1,276	754	36
Crimson Tankard	21	768	712	48

EXPERIMENTS WITH SUGAR BEETS.

Ten varieties of sugar beets have been tested. They were sown in rows 18 inches apart, with the Planet Junior seed drill, adjoining the experimental plots of mangels. The character of the soil and its treatment will be found under that heading. The yield per acre has been calculated from two rows, each 66 feet long, a basis of estimation which is fairly reliable for the purpose of comparing varieties, but one which usually figures up a larger yield than can be got where such roots are grown by the acre. The proportion of sugar contained in each sort has been determined by the Chemist of the Experimental Farms, and the particulars will be found in his report appended. Two of the varieties were kindly supplied by Alfred Musy, Esq., manager of the beet sugar factory at Farnham.

The seed was sown at two different periods, the first set of plots on the 9th and the second on the 19th May. They were all pulled 19th October. On some of the plots the young plants were devoured by cut-worms as soon as they appeared above ground; for this reason the records are not complete.

——	Yield per Acre.		Yield per Acre.	
First Series of Plots, Sown 9th May.	Tons.	lbs.	Bush.	lbs.
Vaurica Yellow Giant (Vilmorin)	31	920	1,048	40
"I. B." from A. Musy, Farnham	27	560	909	20
Green Necked Brabant (Vilmorin)	25	1,480	858	
"C. H." from A. Musy, Farnham	21	1,340	722	20
Klein Wanzleben	18	080	601	20
Second Series of Plots, Sown 19th May.				
Dippe's Klein Wanzleben	39	1,640	1,327	20
Bulteau Desprez, from United States Department of Agriculture	37	1,020	1,250	20
Vaurica Yellow Giant	30	280	1,004	40
"I. B." from A. Musy, Farnham	25	820	847	
Vilmorin No. 1 (Vilmorin)	23	420	773	40
"B. D." from A. Musy, Farnham	22	1,760	762	40
Large Sugar (W. Skaife)	22	1,100	751	40
Klein Wanzleben	19	280	638	
Vilmorin's Improved White (Vilmorin)	18	1,840	630	40
Green Necked Brabant (Vilmorin)	18	080	601	20

EXPERIMENTS WITH CARROTS.

The carrots were also sown in rows 18 inches apart, with the Planet Junior seed drill, and were cultivated by hand with the Planet Junior cultivator. The character of the soil and its treatment was the same as that for mangels. The yield per acre has been calculated from three rows, each 66 feet long. The first series of plots was sown on the 8th May, the second on the 18th May, and all were pulled on the 30th and 31st of October. These plots were less injured by cut-worms than any of the other roots, hence the record is more complete.

—	Yield per Acre.		Yield per Acre.	
First Series of Plots, Sown 8th May.	Tons.	lbs.	Bush.	lbs.
Half Long Red Obtuse	28	1,346	955	46
Half Long White Lisse	27	1,880	931	20
Early Gem or Guerande	23	1,226	783	06
Long Red Obtuse	23	200	770	
Yellow Intermediate	23	053	767	33
Giant White Belgian	22	1,320	755	20
Half Long Red Chantenay	20	1,360	689	20
Half Long Chantenay	20	040	667	20
Large Green Top White Vosges	19	573	642	53
James' Intermediate	19	280	638	
Large White Vosges	18	080	601	20
Long Red St. Valery	17	1,640	594	
Long Red	16	560	542	40
Long Orange Belgian	14	1,626	493	46
Second Series of Plots, Sown 18th May.				
Guerande or Ox Heart	32	973	1,082	53
Large Green Top White Vosges	28	466	941	06
Early Gem or Guerande	27	1,440	924	
Giant White Belgian	27	1,440	924	
Half Long Red Obtuse	27	1,000	916	40
Improved Short White	26	506	875	06
James' Intermediate	23	346	772	26
Yellow Intermediate	23	053	767	33
Long Red St. Valery	22	1,906	765	
New Intermediate	22	1,173	752	53
Large White Vosges	22	880	748	
White Vosges	21	386	706	26
Half Long Red Nantais	20	1,946	699	06
Half Long Chantenay	20	1,360	689	20
Large White Vosges	19	1,453	657	33
Long Orange Belgian	18	666	611	
Orange Giant	17	1,760	579	20
Scarlet Perfection	17	613	576	53
Selected Altringham	14	746	479	06

EXPERIMENTS WITH POTATOES.

One hundred and eleven named varieties have been tested during 1891, and 153 seedlings. The soil and treatment was the same as that described under mangels. They were planted in rows 2½ feet apart. The dates of planting and harvesting are given in the tables, the size of the plots, the yield per acre in bushels and pounds, the proportion of marketable and unmarketable potatoes—all those of 2 inches in diameter and upwards being regarded as marketable. The total yield is given, also the weight of the diseased tubers. The results obtained from the named varieties only are submitted in the tables. The yield per acre in most cases has been calculated from the product of two rows, each 86 feet in length :—

Variety.	Date of Planting.	When Harvested	Size of Plot.	Total Yield per Acre.		Yield per Acre of Marketable Potatoes.		Yield per Acre of Unmarketable Potatoes.		Weight of Diseased Tubers in lbs. per Plot.
	1891.	1891.	Feet.	Bush.	lbs.	Bush.	lbs.	Bush.	lbs.	Lbs.
Daisy	May 11..	Oct. 5..	172 x 2½	534	22	476	7	58	15	8
State of Maine	do 9..	Sept. 9..	do	471	3	454	10	16	53	7
Gleason's Late	do 9..	do 10..	do	470	10	406	54	63	19	2½
Chas. Downing	do 8..	do 8..	do	464	18	396	46	67	32	3½
Frame Early	do 9..	Oct. 5..	do	460	5	413	39	46	26	7½
Summit	do 11..	Sept. 8..	180 x 2½	450	8	414	38	35	30	22
Sharpe's Seedling	do 12.	do 10..	28 x 2½	445	58	...	...	...	...	1
Delaware	do 8..	do 7..	172 x 2½	441	31	334	18	107	13	6
Lee's Favourite (Mrs. Foster)	do 11..	Oct. 5..	86 x 2½	440	40	391	42	48	58	4½
Early Puritan	do 9..	Sept. 9..	172 x 2½	432	14	373	8	59	6	18½
Algoma No. 1.	do 7..	do 7..	do	428		392	33	35	27	0
Burpee's Seedling	do 8..	do 10..	do	425	29	388	20	37	9	11
Green Mountain.	do 8..	do 11 .	do	423	47	366	23	57	24	16½
Halton Seedling	do 9..	do 10..	do	422	56	350	20	72	36	15½
Early Sunrise	do 11..	do 11..	do	422	6	366	23	55	43	9½
Alexander Prolific.	do 9..	do 9..	do	415	21	356	15	59	6	17½
Late Goodrich	do 8..	do 11..	do	403	31	348	39	54	52	2½
Early Ohio	do 11..	Oct. 5..	do	400	59	373	8	27	51	10½
Pearl of Savoy	do 9..	Sept. 8..	do	397	36	330	55	66	41	3
Pootaluck	do 15..	Oct. 7..	do	395	56	315	44	80	12	2
Select Magnum Bonum.	do 11..	Sept. 9..	do	391	42	334	18	57	24	0
Lee's Favourite	do 7..	do 7..	do	389	10	301	22	87	48	0
Wonder of the World	do 9..	Oct. 5..	do	382	25	360	28	21	57	5½
Early Albino	do 8..	Sept. 10..	do	379	2	319	6	59	56	8
Rural Blush	do 8..	do 10..	do	375	40	346	58	28	42	4
Holborn Abundance	do 9..	Oct. 5..	do	375	39	332	36	43	3	1½
Burpee's Extra Early	do 15..	do 7..	do	374	49	333	27	41	22	½
White Star from Dewar	do 9..	Sept. 10..	do	373	59	308	8	65	51	7
Rennie's Stray Beauty	do 11..	Oct. 5..	do	366	22	325	51	40	31	0
May Queen Early	do 11.	Sept. 10..	do	364	42	315	44	48	58	0
Dakota Red	do 7..	do 7..	do	362	9	303	54	58	15	¼
Clarke's No. 1	do 8..	do 11..	do	360	44	339	22	21	22	18½
Empire State	do 11..	do 8..	do	360	28	281	57	78	31	24
Vermont	do 8..	do 11..	do	358	47	298	51	59	56	20
Thorburn	do 18..	Oct. —..	86 x 2½	357	56	327	33	30	23	0
Sukreta	do 11..	Sept. 8..	172 x 2½	357	6	313	12	43	54	5
Ohio Gunner	do 8..	do 9..	do	354	34	298	51	55	43	18½
Dumfries Early White	do 11..	do 9 .	do	353	42	299	41	54	2	14½
Burpee's Surprise.	do 11..	do 9..	do	352	52	300	32	52	20	29
Algoma No 2	do 8..	do 9..	do	349	29	289	33	59	56	1
Crown Jewel	do 9..	Sept. 10..	do	347	48	295	28	52	20	2
Beauty of Hebron	do 11..	Oct. 5..	do	347	48	295	28	52	20	1
Flower of Eden	do 8..	Sept. 10..	do	347	48	307	17	40	31	16½
Prairie Seedling	do 11..	do 8..	do	341	3	300	32	40	31	0
Early Eating	do 11..	do 11..	do	339	22	279	26	59	56	10
Gov. H. Foraker.	do 9..	do 10..	do	326	42	286	11	40	31	0
Vanguard	do 7..	do 7..	do	323	20	240	36	82	44	2
Blue Bell	do 9..	do 9..	do	321	38	297	9	24	29	3½
Early Rose	do 11..	do 9..	do	315	44	273	31	42	13	2½

RESULTS obtained from named varieties of potatoes, &c.—*Concluded.*

VARIETY.	Date of Planting.	When Harvested	Size of Plot.	Total Yield per Acre.		Yield per Acre of Marketable Potatoes.		Yield per Acre of Unmarketable Potatoes.		Weight of Diseased Tubers in lbs. per Plot.
	1889.	1889.	Feet.	Bush.	lbs.	Bush.	lbs.	Bush.	lbs.	Lbs.
Emperor William....	May 8..	Sept. 8..	172 x 2½	302	54	271	50	31	4	2½
Algoma No. 3...............	do 15..	Oct. 7..	do	302	13	255	47	46	26	8½
Chicago Market..	do 11..	Sept. 9..	do	301	23	252	25	48	58	8½
Compton's Surprise..........	do 9..	do 10..	do	301	22	251	34	49	48	6½
Rose's New Giant............	do 11..	do 8..	do	296	18	282	48	13	30	½
Rosy Morn....	do 11..	do 11..	do	295	28	244	49	50	39	2½
Richter's Improved..........	do 11..	do 10..	do	293	47	256	38	37	9	4½
St. Patrick...	do 9..	Oct. 5..	do	284	30	189	57	94	33	45½
White Star......	do 8..	Sept. 10..	do	276	3	207	40	68	23	8
Carter's Sukreta.......... .	do 7.	do 8..	do	274	21	224	33	49	48	2
London..	do 9..	do 10..	do	271	50	222	52	48	58	7
Brownell's Winner......	do 9..	do 9..	do	270	59	235	32	35	27	7
McIntyre....................	do 15..	Oct. 7..	do	269	18	230	28	38	50	0
Rural No 2............	do 15..	do 7..	do	262	32	241	26	21	6	0
Prime Minister	do 11..	Sept. 8..	do	260	51	210	12	50	39	4½
Minister.......	do 8..	do 8..	do	260		224	33	35	27	0
Corona Beauty.	do 8..	do 8..	do	254	57	211	3	43	54	10½
Beauty of Beauties...	do 8..	do 11..	do	254	57	195	51	59	6	2
Cosmopolitan...............	do 7..	do 7..	do	254	57	189	57	65		½
International Seed Co........	do 8..	do 9..	do	253	15	233	50	19	25	0
Rose's New Invincible........	do 8..	do 7..	do	250	43	200	55	49	48	2
Sugar	do 11..	do 10..	do	248	12	204	18	43	54	1
Richter's Schneerose.........	do 11..	do 11..	do	247	21	193	19	54	2	6
Carter's Delight........... ..	do 7..	do 8..	do	246	30	189	6	57	24	½
Early Callao................	do 9..	Oct. 5..	do	244	48	211	53	32	55	1
Early Maine.	do 9..	Sept. 8..	do	240	36	215	16	25	20	0
Carter's Surprise.......	do 11..	do 11..	do	235	32	167	9	68	23	¼
Carter's First Crop, Ash Leaf.	do 11..	do 10..	do	228	46	195	51	32	55	0
Thorburn's Paragon..........	do 8..	do 8..	do	225	23	175	35	49	48	1
Ruby.........	do 11..	do 10..	do	223	42	158	42	65		0
Brownell's Best........	do 8..	do 9..	do	216	5	172	13	43	52	4½
Great Eastern...............	do 11..	do 8..	do	205	59	182	21	23	38	2½
Snowflake......	do 8..	do 9..	do	193	19	140	59	52	20	4½
King of the Earlies..........	do 9..	do 9..	do	193	19	163	46	29	33	3
Ruper Eating Crane..........	do 8..	do 8..	do	192	28	156	10	36	18	¼
Bliss' Triumph...............	do 8..	do 9..	do	168		155	20	12	40	0

SEED TESTING.

The testing of the vitality or germinating power of samples of seed grain sent by farmers from all parts of the Dominion has been continued. During the season 2,957 samples were tested, which is more than double the number which was tested in 1890. Among these there were more than 1,200 samples of two-rowed barley, chiefly from Ontario, which showed an excellent average of about 95 per cent. The house, which was built partly for this purpose, is shown in Fig. 2; it is commodious and

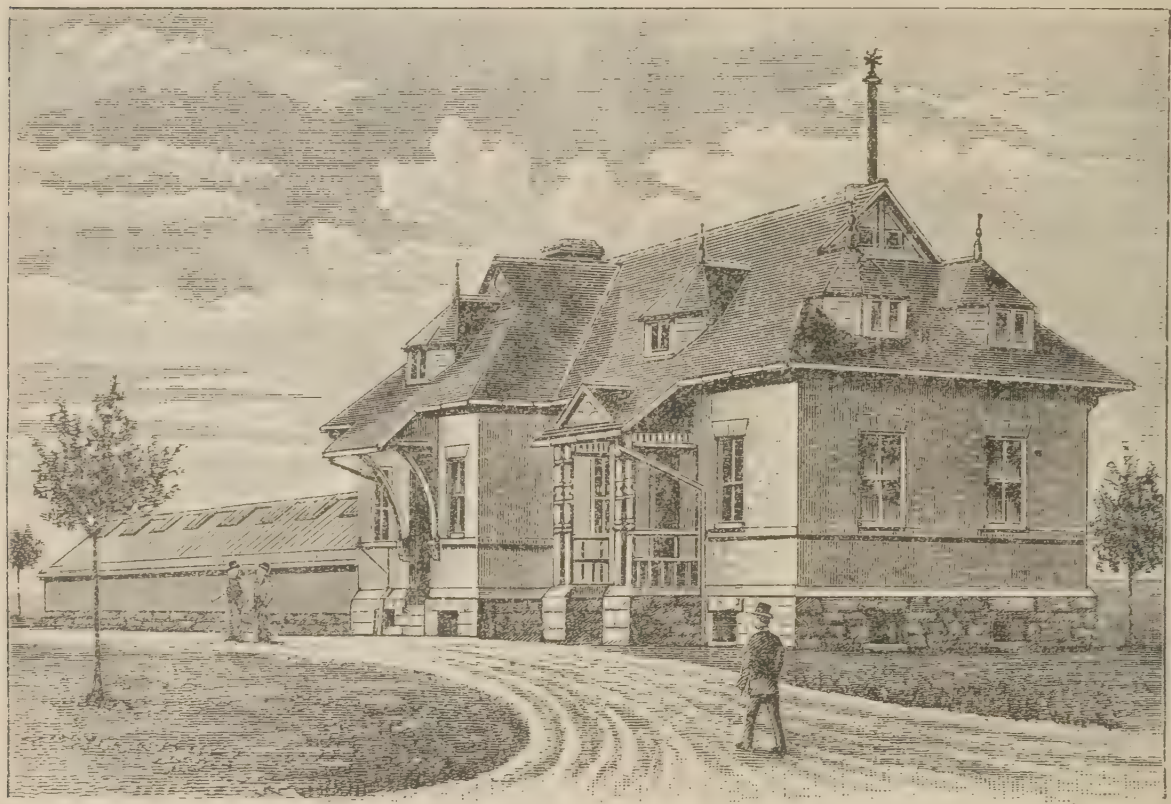

FIG. 2.—Building for seed testing and seed grain distribution.

well adapted for the work. The hinder portion consists of two glass structures, each about 75 feet long, one of which is devoted to seed testing and propagating; the other contains a most instructive collection of named plants and shrubs from all parts of the world. The front part is used for storing seed grain, and it is from this building that the large annual distribution of seed grain is made to applicants from every part of the country, from the Atlantic to the Pacific.

RESULTS of grain tests, 1890–91.

Kind of Seed.	Number of Tests.	Highest Percentage.	Lowest Percentage.	Average Vitality.
Wheat	561	100	1	82·3
Barley	1,556	100	4	92·3
Oats	262	100	6	88·8
Corn	82	100	0	66·7
Rye	9	91	66	81·0
Millet	2	75	75	75·0
Buckwheat	10	100	60	84·6
Grass	29	98	0	45·6
Turnips	28	100	0	78·8
Peas	37	100	20	79·9
Carrots	26	84	0	44·6
Clover	9	87	57	66·6
Beans	18	100	2	59·7
Beet	16	68	18	37·1
Mangel	15	94	12	61·8
Chana	2	38	0	19·0
Sugar cane	2	41	19	30·0
Rhubarb	3	29	8	15·6
Onions	3	80	0	45·0
Flax	5	95	75	88·6
Parsnips	4	85	45	60·5
Cabbage	23	92	2	51·6
Cauliflower	5	71	33	51·4
Radish	8	93	31	67·0
Spinach	2	42	23	32·5
Tomato	7	91	31	56·4
Celery	2	18	1	9·5
Lettuce	2	84	60	72·0
Flower seeds	7	87	0	42·7
Tares	1	....	....	94·0
Canary seed	1	....	....	96·0
Hemp	1	....	....	0·0
Asparagus	1	....	....	92·0
Pumpkin	1	....	....	80·0
Cress	1	....	....	68·0
Parsley	1	....	....	4·0
Sage	1	....	....	6·0
Thyme	1	....	....	5·0
Ash	1	....	....	0·0
Maple	1	....	....	0·0
Fir	1	....	....	0·0
Total number of samples tested, highest and lowest percentage, and average vitality	2,757	100	0	85·6

TWO-ROWED BARLEY.

In the annual report of the experimental farms for 1890 reference is made to the importation from England by the Government of a large lot of one of the best varieties of two-rowed barley for seed, which was sold to farmers at less than the cost of importation, in order to thoroughly test the value of this grain in all parts of the Dominion. It is there stated that a shipment of 50 quarters, 400 English bushels, of the barley grown from that seed, weighing about 52 lbs. per bushel had been forwarded to London, England, to be malted and brewed by one of the leading brewers there. This barley consisted of five or six lots, grown in different parts of Ontario. It was all forwarded to Ottawa, where the barley was thoroughly cleaned and mixed under my supervision, and the small kernels and as much as possible of the broken grain removed by passing it through a Sizer or Boby machine, so that the sample was fairly uniform in character.

The following report was received in October last by the High Commissioner of Canada, through Mr. A. F. Dale. It contains the result of the brewing of this barley conducted at the brewery of J. Flinn, Esq., of Bishops Stortford, England, and the report is signed by Mr. Arthur O. Stopes, of Colchester:—

"In compliance with your request, I have pleasure in stating to you my opinion of the sample of malt sent me on 23rd May last, which I understand was made exclusively from Canadian barley sent you by the Dominion Government.

"From careful examination of this malt, and from information furnished me by brewers well acquainted with the use of Canadian malt in the Dominion, and also from suggestions made by the well-known brewery expert, Mr. Frank Faulkner, I felt justified in using this malt exclusively without any mixture of other malts. I therefore proved its brewing qualities entirely upon its own merits, and, to test it as severely as possible, I brewed a pale ale from it, although I fear the colour is a little higher than I generally get from malt made from English or European barleys.

"The brewing worked easily, and I liked the handling of the goods in tun and the way they spent, indicating from the initial stages the quality of the malt. Each successive stage followed in proper sequence in exceedingly good form; the fermentation was practically perfect, and the condition of the beer at racking was exceedingly good. The final attenuation also was just as I wished, and, as a consequence, I think the brewing operations were those well adapted to the malt, and it must have been of good quality to have given such satisfactory results at every stage.

"The stability I have proved to be exceedingly good, indicating soundness of material.

"The extract was equivalent to 87 lbs. per quarter; and, coupling all the preceding facts with the judgment I formed of the malt, irrespective of its use, I assay its value 35s. to 36s. per quarter. I may say that had I wished to obtain a greater extract, so as to attain the maximum amount possible, I could readily have increased it, but I deemed it under the circumstances preferable to secure quality rather than quantity.

"The beer after racking has remained entirely satisfactory, and the very numerous people who have tasted it have been almost without exception of opinion that it is exceedingly good.

"Should you wish to have fuller and more complete notes of a more technical class, either as to the nature of the water employed in the brewing and of the malt itself, I shall be happy to place them at your disposal. I assume the above report is sufficient for your present purposes, and I have much pleasure in testifying, as a practical brewer, to the value that good malt of this class would prove to the brewers who understood it use.

"October, 1891."

This report is highly satisfactory and shows that good two-rowed barley, such as will meet the approval of the English brewer, can be grown in Canada, and many samples, much better in quality and heavier than this shipment referred to, have been received of late at the Experimental Farm from farmers in Ontario, the growth of 1891.

Favourable reports as to the yield of the barley have been received from every hand, and it is the general opinion that the crop of the two-rowed has averaged much better than the six-rowed. Many reports of yields of 40 to 50 bushels per acre have been received from different points in Ontario, although some of the samples sent in have been light in weight and much discoloured. The buyers in the barley districts in Ontario paid up to the close of navigation from 8 to 12 cents more per bushel for the two-rowed than was offered for the six-rowed; but in many instances no care seems to have been taken to grade the purchases, but light and heavy, bright and discoloured lots, were all mixed together, making a very uneven sample. Much broken grain was also found in some lots. The returns received for some of the shipments are said to have been very unsatisfactory, having resulted in loss to the shippers. This disappointment, however, is clearly traceable to want of care in

threshing, cleaning and grading the grain. The fault lies partly with the farmer, who must exercise more care in handling this crop if it is to bring him its full value. In a letter written by a practical Canadian maltster who recently visited England in connection with the barley business of his firm, he says, when referring to the disappointing sales: "Shippers have not kept faith with the brokers or purchasers as to quality, the bulk was not equal to the sample." Again, "All brewers who saw the Government farm samples at the brewers' exhibition were charmed with them, and millions could have been sold, but the general crop did not equal the samples. I may say that unless the Canadian barley can be threshed so as to avoid the large proportion of half and broken grains, which cause excessive mould on the floors, the trade won't materialize. All English maltsters agree on this point." This gentleman speaks quite hopefully of the Canadian six-rowed barley for the English market, and says it is beginning to find favour with several maltsters who have tried it.

Other Canadian dealers speak more hopefully of the two-rowed barley trade. One says: "The two-rowed barley we have handled this season, grown from English seed, has given us the best of satisfaction, and I believe that all that has gone forward to the old country would have done likewise had it not been badly mixed."

Another buyer who visited England in connection with his barley business writes: "In November sales were made in Great Britain by sample to arrive of both two-rowed and six-rowed. The former was received with much favour by maltsters; the latter did not attract much attention. I am not, however, surprised that the demand for export has fallen off, for many sales were filled with shipments quite inferior to the sample; the result was disappointment and resentment on the part of the receivers." He says, further: "It is a mistake to suppose that the English maltster does not require colour; he does, and the bright sample will in every case take the market there, as in the United States. I desire to impress strongly on farmers the necessity of growing from pure seed, and in harvesting and threshing to carefully avoid mixing. I found a very kindly feeling expressed towards Canada, and a marked desire to trade with her. I am convinced that if we can grow as good barley as we have done this year, and if it is kept pure, we will work into a good trade with the English maltsters."

Enough has, I think, been said to show that if the Canadian farmer will exercise the requisite care in the selection of good, clean seed and in the cultivation of this grain, also in threshing and cleaning it for the market, avoiding all mixing; and if the shipper will see that the bulk of the grain he sends is equal to the samples forwarded, there seems no reason to doubt that a satisfactory trade in two-rowed barley can be established. The maltster in Great Britain is willing to pay a good price for a first-class article.

RESULTS OF EARLY, MEDIUM AND LATE SOWING.

Experiments in this important line of work have been continued, but the same varieties of grain have not been used in every instance. In the experiments conducted in 1890 the Red Fife and Ladoga were the sorts of spring wheat chosen; in 1891 the varieties were Campbell's White Chaff and White Connell. The oats in 1890 were Prize Cluster and Early Race Horse, in 1891 Prize Cluster and Banner, and the barleys which, in 1890, were two varieties of two-rowed, the Prize Prolific and Danish Chevalier, were changed in 1891 to one of two-rowed, the Prize Prolific, and one of six-rowed, the Baxter.

The method adopted in 1890 of six successive sowings a week apart was repeated in 1891, the first sowing in each case being made as soon as the land was fit to receive the seed. The same land was used in both instances, but the arrangement of the plots was changed, so that the oats followed wheat, barley followed oats and wheat followed barley. The land was ploughed in the autumn of 1890, and received a coating of manure of from 20 to 24 tons to the acre in the spring of 1891, which was promptly covered after spreading by a light ploughing.

In the following table the results are presented in a form convenient for comparison:

	Sown, April 21. — Yield, per Acre.		Sown, April 28. — Yield, per Acre.		Sown, May 5. — Yield, per Acre.		Sown, May 12. — Yield, per Acre.		Sown, May 19. — Yield, per Acre.		Sown, May 26. — Yield, per Acre.	
Spring Wheat.	Bush.	lbs.	Bush.	lbs.	Bush.	lbs.	Bush.	lbs.	Bush.	lbs.	Bush.	lbs.
Campbell's White Chaff...	47	50	32	50	27	30	29	30	28	30	19	10
White Connell...........	35	50	26	40	30	00	23	20	23	40	27	10
Oats.												
Prize Cluster............	59	24	84	04	54	24	33	08	53	03	40	00
Banner..................	76	01	79	24	86	26	87	22	78	18	55	30
Barley.												
Prize Prolific...........	65	10	55	35	50	20	51	37	40	40	37	14
Baxter's Six-rowed.......	55	35	67	04	56	32	42	39	34	08	35	30

The crops on the plots for 1891 were much heavier than those gathered in 1890; the difference may be partly accounted for by the liberal dressing of manure which the land received, but probably a greater allowance should be made for the character of the season, which was very favourable in 1891 and very unfavourable in 1890. There are some seeming contradictions in the results for 1891 which can be explained and others for which at present no full and satisfactory explanation can be offered.

The plots of Prize Cluster oats and Baxter's barley which were sown the first week were at the northern end of the series, and were exposed to the full force of a storm of wind, which carried much sand with it, and which swept over the part where these plots were situated a few days after the grain was up. This cut the tender blades almost to the ground and permanently injured the plots. The Prize Prolific barley, Banner oats and the two varieties of wheat were partly sheltered by a slight depression in the land, and thus escaped much injury. From the results of the tests for both years it is evident that the oat crop is less influenced by delay in sowing than either wheat or barley. Some of the other apparent irregularities were partly due to the results of a hailstorm which passed over the farm when the grain from some of these plots was standing, and a part of it was beaten out and lost. This will account for the difference between the crops from the fourth and fifth sowings of the Prize Cluster oats.

Taking the returns of the two years together, the average falling off from week to week in the yield of the four varieties of wheat as compared with the crop from the first sowing is, for the first week 27 per cent., for the second 30, third 43, fourth 45, and for the fifth 52 per cent. Calculating the average loss on the barley in the same manner we find it to be as follows: First week 13 per cent, second 26, third 36, fourth 51, and for the fifth 52 per cent. Leaving out of consideration the first series of oat plots on account of their abnormal character in 1891 and their partial character in 1890, and taking the crop from the second sowing as the basis for comparison, we find the falling off in the successive weeks to be 12 per cent, 24, 26, and for the last sowing 43 per cent, showing that even with the oat crop delay in sowing cannot be practised without loss.

When we consider that the value of the spring wheat crop for the past year, of Ontario alone, taking it at 85 cents per bushel, was $9,104,807; that of barley at 45 cents per bushel, $7,263,856; and that of oats at 30 cents per bushel, $22,502,862—or putting these three together, nearly thirty-nine millions of dollars—the percentage

of loss which occurs between the first and second, or first and third sowings, represents a sum so large that the importance of early seeding cannot be too strongly urged.

FORESTRY.

Tree-planting in the forest belts on the Central Experimental Farm has been continued, and about 3,100 trees have been set out along the northern boundary of the farm. It is proposed to continue this planting until the whole length of this side of the farm is furnished with a continuous shelter belt. This will eventually prove a very attractive feature, and also furnish important data in regard to the relative growth of the more important trees of economic value in this country, so that information may be available to those who may need in the future to plant trees either for shelter, ornament, fuel or timber.

The belts already planted are making good growth; the avenues and hedges are also doing well. The clumps of ornamental trees and shrubs about the buildings and along the roads have become well established, and already add much to the appearance of the place.

In this connection I desire to acknowledge the kindness of Prof. Sargent, of the Arnold Arboretum, Jamaica Plains, Mass., who has generously donated to the experimental farms 81 species of trees and shrubs, many of them rare sorts. A part of these are suitable for planting at Ottawa; the more tender sorts have been forwarded for test to the experimental farm at Agassiz, British Columbia. To Mr. L. Jackson Dawson, the efficient superintendent of the arboretum, my thanks are also due for his kindness in making the selection, comprising varieties so well adapted to our needs.

The distribution of forest trees and forest-tree seeds to settlers on the North-West plains has been continued. In the report of the Horticulturist particulars will be found of the distribution of about 2,000 mail packages of seedling forest trees, also of 4,053 packages of tree seeds, chiefly those of the box elder, Manitoba ash, oak and cherry. This part of the experimental farm work has awakened in the Canadian North-West a very general interest in tree-planting. From the large number of young groves which are thus being established at different points on the great plains, belts and plantations of trees will shortly be planted about dwellings and farm buildings which, in process of time, will afford desirable shelter for man and beast and much improve the general appearance of the country. In a very few years many of these young groves will produce seed, and with tree seeds in plenty, available at so many points, tree culture on the plains will no doubt make rapid advancement.

BUILDINGS.

The extension to the poultry building mentioned in the last annual report has been completed, and will furnish pens for both breeding and laying, as well as some for experiments with cross breeds. The necessary buildings for carrying on the work on the Central Experimental Farm are now nearly completed. They consist of a barn about 145 x 50 feet, with a wing on either side of 100 x 25 feet, one of which is used for the farm horses; the other is fitted up for bulls. This commodious building is shown in Fig. 3:

The silos are attached to one end of this; also an engine-house, from which shafting is run the full length of the barn. There is also an implement house, granary, root-house and piggery. The poultry building has been already referred to; the building for seed testing and the distribution of seed grain is shown on page

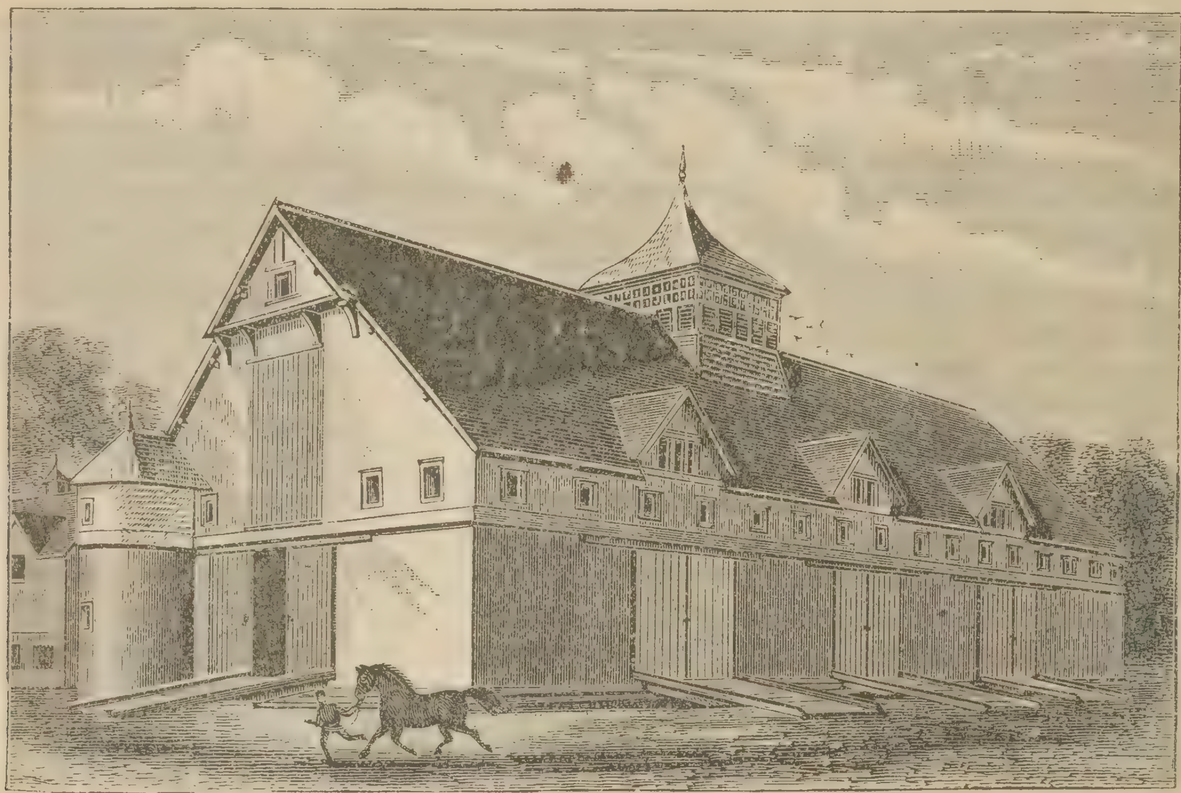

FIG. 3.—Barn and Stables, Central Experimental Farm, Ottawa.

46, Fig. 2. That containing the offices and chemical laboratory forms the frontispiece, Fig. 1. The dairy building is represented on page 88, Fig. 4. The only other building for which there is now a pressing need is one for sheep, which should also have some additional accommodation for young stock.

ANNUAL VISITS TO THE BRANCH EXPERIMENTAL FARMS.

NAPPAN.

The experimental farm for the the Maritime Provinces, located at Nappan, N.S., was twice visited during the year. The first visit was during the planting season, in the spring, when opportunity was afforded for arranging the various clumps of trees and shrubs which are to serve the purposes of ornament and shelter about the buildings, also the avenues and shelter belts along the boundaries of the farm. These will greatly help in beautifying the place, and in a very few years, from the shelter they will afford, prove useful as well as ornamental. The second visit was paid in the autumn. The grain crops were all gathered before my arrival, and they were unusually good, as will be seen from the report of the superintendent. I had the privilege of inspecting the crop of roots, of which there were about five acres. They were all good, the turnips especially so; these latter averaged over 1,000 bushels to the acre. The farm is improving in appearance and fertility from year to year, and that part of the land which at the time of purchase was believed by the neighbours to be almost worthless from exhaustion, has, with proper working and manuring, become quite fertile, and produces now some of the best crops grown on the farm.

BRANDON.

The journey westward was begun on the 11th of August, and Brandon was reached on the 16th. As viewed from the hotel in the city, it was evident that the

young avenues had made good progress and that the trees and shrubs generally were making satisfactory growth. One of the most striking features from this distant view was a field of Ladoga wheat, which extended from the base of one of the gradually-rising bluffs on the valley bank some distance up its side. Part of it was cut, and that which was standing was of that warm brown colour which indicated ripeness, while the other varieties on either side appeared comparatively green.

On closer inspection everything was found to be progressing satisfactorily. The grain crops were nearly all more or less lodged, as the result of a severe rain and wind storm which had occurred a day or two previous. The straw was long and the heads heavy, which prevented most of the grain from rising again, and thus somewhat lessened the yield. The returns, notwithstanding, are exceedingly good. The forest belts and young fruit trees were carefully examined and notes taken of the most promising sorts. The barn and stable was completed and ready for occupation. Several of the most useful breeds of stock have since been supplied, which makes this now one of the most interesting and instructive features of the farm work. The superintendent's residence was also finished, and was occupied shortly after.

A constantly increasing interest is manifested by the farmers of Manitoba in the operations going on at this farm, and the number of visitors who go there to gain information and experience each year is now very large. The experimental work carried on under Mr. Bedford's superintendence is favourably spoken of on all hands, and the experiments tried from year to year are proving a valuable guide to the farming community.

VISIT TO MELITA.

The day after my arrival in Brandon, the Souris section of the western division of the Canadian Pacific Railway was opened, and by kind invitation of the assistant superintendent, Mr. J. Murray, I was privileged to travel with the first regular train as far as Melita, 66½ miles from Brandon. For the first 8 miles to Kenmay the train runs over the main line, then turning south 16 miles brings the traveller to the Souris river, whose wooded banks lend a charm to the scenery. Another 14 miles brought us to Hartney, one of the new towns recently started, and after journeying 26 miles further, Melita, the present terminus, was reached. This town, which was said to be only one year old, had a population of about 300, and seemed to be growing rapidly. Through the courtesy of one of its enterprising residents, Mr. G. L. Dodds, I was driven to see several of the neighbouring farms, where the crops gave promise of an excellent yield. The country looked well the whole length of the route; most of the land seemed to be good, and settlement was progressing rapidly. Several new towns seen along the line, from two weeks to two or three months old, were struggling rapidly through their babyhood; most of them could boast of an elevator built or building, and one or more stores, surrounded by dwellings of that diversified character so general in the newly-established towns of the west.

INDIAN HEAD.

On the 20th of August the farm for the North-West Territories was reached, where the field and garden crops, the forest trees and fruits were examined, and their condition and progress recorded. The grain was all standing well, and gave promise of an abundant harvest, but in consequence of the moisture of the soil, resulting from an unusual rainfall and cool damp weather, the grain was from a week to ten days later than usual. For this reason some of the crops did not ripen early enough to entirely escape the frost, although it did not reach this district until about two weeks after it had occurred in Manitoba. A very large proportion, however, of the grain ripened here before frost.

The forest trees planted in blocks and shelter belts are making good progress, but are not growing so rapidly as those at Brandon. The results of the tests of fruit trees have not thus far been very encouraging; but most varieties of small fruits grow well in the rich soil found here, and many of them are proving hardy.

The herd of cattle is increasing, and the animals doing well. The use of the bulls is a great advantage to the farmers of the district.

On the 22nd some of the neighbouring farms were visited and the crops examined. Several miles of luxuriant wheat fields were seen on the Bell farm and on the recently established farm of Lord Brassey. The crops on many smaller places were also inspected. Everywhere the wheat looked well, and the growth was luxuriant, but it was noticed here as well as in Manitoba, that wheat on summer fallow where the land was heavy and had been well farmed was much later than that growing on lighter and poorly worked soil. This was a result of the unusual rainfall, and should not lessen confidence in summer fallowing, as such a condition may not occur again to the same extent for years.

Leaving Indian Head on the 23rd, a day was spent in the Regina district, where the crops were also very promising; a drive of about 40 miles enabled us to see many of the neighbouring farms, on most of which the farmers subsequently reaped a rich harvest.

VISIT TO PRINCE ALBERT.

On the 25th an early start was made for Prince Albert. After leaving the Qu'Appelle valley the land along the line of railway seemed light and gravelly, but after crossing the river near Saskatoon the soil looked much more fertile. Soon the appearance of the country was entirely changed as we entered on what is called the fertile belt, which extends from south of Duck Lake to a long distance beyond Prince Albert. This district is in many parts well wooded and intersected with lakes and streams, and most of the soil is a rich, black, sandy loam. Prince Albert was reached about dusk.

The next day a drive of about 40 miles was taken, covering part of the country on either side of the town. A number of farms were visited, among the rest those of Mr. T. Mackay, Mr. T. Miller Mr. Wm. Plaxton and Mr. T. Scott. Much of the Ladoga wheat grown in this section had been cut and some of the Red Fife was nearly ready. Nearly all the wheat was subsequently harvested without injury from frost. The country is remarkably pretty and park-like, undulating, and intersected at many points by groves of woodland and belts of timber, consisting of spruce, jack pine, tamarack, poplar, birch and other trees. The Saskatchewan here is a fine navigable river. In the evening a gathering of townspeople and farmers assembled to listen to a talk on the work of the experimental farms. The opportunity was also improved by pointing out the advantages of mixed farming, for which, from the presence of abundant shelter, the luxuriant growth of grasses, and a plentiful supply of water for stock, this part of the country seems specially adapted.

Returning the next day, Moose Jaw was reached on the 28th, where another drive of about 30 miles was taken among the neighbouring farms. The crops here, as at Regina and Indian Head, were excellent, but they were later than those at Prince Albert.

THE SPULMACHEEN AND OKANAGON VALLEYS.

Journeying westward, the next point of divergence was Sicamous, B.C., from which point entrance can be made to the fertile Spulmacheen and Okanagon valleys. The conveyance for the first part of the journey, which was begun on the 3rd of September, was a steam hand-car, which made a daily trip to Enderby over the new line of railway then under construction to Vernon. This was an open conveyance with two seats, capable of accommodating six passengers and the engine driver, who stood behind to feed the little engine with fuel and regulate the speed of travel. Such a conveyance afforded a full view of the scenery, which was very fine. Lake, woodland, mountain and valley in rapid succession, or combined in endless variety of form, made up the ever-changing panorama. Smoke from some burning woods in the neighbourhood sometimes interfered with the view; but for this, the bright sunny day would have been perfect. A ride of 25 miles in the steam hand-car

brought us to Enderby, a thriving village in the Spulmacheen valley, where there is a large milling industry which supplies the greater part of the flour used on the Pacific coast. Here a vehicle was waiting to take us to Lansdowne, another village six miles distant, where another conveyance and driver was engaged for the whole journey to Mission and return to Enderby. From Enderby to Lansdowne the road passes through a beautiful part of the valley, where there are some very fine farms, on some of which the grain had been harvested and stacked ; on others the golden sheaves were still stooked in thickly-set groups over the fields. A visit was paid to the farm of M. Lumby, Esq., who has a very fine estate of 1,200 acres. Most of his grain was housed, but from the appearance of the bright and thickly-set stubble on his fields it was evident that he had gathered a bountiful harvest. His crops are all grown without irrigation. Near his residence, which is prettily situated near the bank of a small stream, are some groups of magnificent specimens of the "bull pine" (*Pinus ponderosa*), a variety with very long needle-like leaves, one of the most useful of all the trees found here in the valleys and on the hill sides. They grow to a great height and large size, and an average tree when felled will make several large logs for the lumberman.

At Lansdowne several small orchards were seen. The apples, pears and plums were making thrifty growth, and some of the young trees were bearing fruit. On the journey from Enderby to Vernon a team was passed drawing a large waggon loaded with watermelons which had been raised on a ranch near by, and which were being taken to Enderby for shipment to distant points. Vernon, the terminus of the new line of railway, was reached about 7 p.m., after a delightful drive through a charming country.

Many new buildings were going up in this thriving town, which promises in the near future to be an important place in the Okanagon valley. It is well situated, on a level plain, well watered by a mountain stream which affords facilities for irrigation, without which fruit-growing or gardening is somewhat uncertain here.

On the morning of the 4th a journey to Mission was undertaken. The first part of the road lay over the hills, which rise to the height of 600 or 700 feet, from the summit of which a lovely view is had of a charming sheet of water known as Long Lake, and for many miles the road lay very near its banks. About three miles north of Mission a halt was made to inspect a promising young orchard on the ranch of Mr. Whelan, in which was found many varieties of apples, pears, plums and cherries, all making very thrifty growth. Many of the apple, pear and plum trees were well laden with fruit. Several peach trees were seen on this place, but no peaches, excepting on one tree, where there were several small specimens, which looked like a seedling fruit. There was an almond tree also here with a few almonds growing on it. On arrival at Mission early in the evening a visit was paid to the ranch recently purchased by Lord Aberdeen. This is a fine piece of valley land, nearly level and well watered by Mission creek, so that irrigation is practicable over the greater part of it. Several acres were already planted with large and small fruits, and we were informed that it was intended to plant much more largely during the coming season. That part of the Okanagon valley of which Mission is the centre is said to be about 16 miles long and 5 or 6 miles wide. There is a small orchard on the property adjoining Lord Aberdeen's, on which there was some very fine apples and Bartlett pears. There were also a few trees fruiting well in the garden worked by the Brothers at the Mission. A limited amount of grain is grown, stock-raising being the principal industry. Much of the soil in these valleys is a rich black loam with a clay subsoil; most of that along the hill-sides is lighter. Heavy crops can be grown wherever water for irrigation is available, and it is said that grain and other farm crops can be grown as far as Vernon without irrigation; but south of this the returns are very uncertain where no water is at command.

Returning to Vernon the following day we found a very fine collection of young bearing fruit trees in the garden of Price Ellison, Esq., a gentleman who kindly volunteered to go with us to Mission. To this genial companion we owe a

debt of gratitude; but for his guidance and thorough knowledge of the country, we should have missed many an important fact and had a much less enjoyable time.

AGASSIZ.

This most westerly of the experimental farms is improving rapidly. More than one hundred acres are now under cultivation, several large orchards have been planted, and many fruit trees and vines have been put out on the bench land, about the base of the mountains. Many additions have been made to the list of fruit trees, vines, forest and ornamental trees and shrubs—the collection now includes nearly all the varieties at present obtainable, which promise to be useful to the country. The value of this farm as a testing ground for that part of the province lying within the coast climate will be very great, and the information which will soon be available will be highly prized both by old residents and incoming settlers.

A commodious and conveniently-situated dwelling has been erected for the superintendent, and a barn and stable contracted for which, it is expected, will be completed in July next.

SUMMARY OF REPORTS OF OFFICERS.

REPORT OF THE AGRICULTURIST.

The important topics discussed in the report of the Agriculturist are presented in five divisions, each of which contains much valuable information. In the first division, headed "cattle," the value of different sorts of food for the economic feeding of cows and the fattening of steers is treated of, and the relative cost of the different rations. The results of experiments in varying the quantity of meal in the rations are also given. The information gained points clearly to the great value of corn ensilage as a cheap and nutritious food, of that succulent character most desirable for winter feeding.

Part 2 contains valuable data in reference to the fattening of swine, with such particulars as to the cost of producing pork, from certain kinds and mixtures of food, as will make this section of the report very serviceable to farmers in all parts of the Dominion. The great stimulus which has been given to the production of pork during the past year will make this information most timely and useful.

The results of the experimental dairy work embodied in Part 3 point to the most economical methods of treating milk for the manufacture of butter. The varying conditions brought about by different sorts and combinations of food, by advancement in the period of lactation, and the variations in the quantity and quality of these products arising from treatment by different methods, from peculiarities of constitution in the cow or from other factors not yet fully understood, make this chapter most interesting and useful to all those who are engaged in the dairy industry.

The setting aside of forty acres of land for a special line of work, with the view of showing how many cows can be maintained with the crops which that acreage will produce, forms the subject of Part 4. Judging from the experience thus far gained, it would appear that on most farms a larger number of cattle than are now kept might be maintained, bringing increased gain to the farmer.

In the 5th division, which treats of fodder corn and the silos, the results of the many tests which have been made during the past year are given. There will also be found the yields of the different varieties under different methods of cultivation, experiments in making ensilage, with particulars as to the character of the products obtained, with much other useful information on this very important subject.

REPORT OF THE HORTICULTURIST.

The report prepared by Mr. John Craig, the Horticulturist of the Central Experimental Farm, contains a large fund of useful information related to the growing of

fruit and vegetables. The results of the experience gained during the past few years, both in Canada and the United States, with the hardier forms of Russian apples, and the particulars regarding the quality and relative hardiness of the different sorts, will be read with much interest by those who desire to cultivate apples in the more northern portions of the Dominion. The remarks on hardy sorts of plums, pears and cherries will also repay a careful perusal.

The very full notes given by Mr. Craig on the many varieties of grapes which were ripened on the Central Farm last year will be very valuable to those engaged in growing this fruit for market, as well as to amateurs, and to many readers it will no doubt be a revelation to learn that so many fine sorts of this refreshing fruit can be ripened at Ottawa. That portion of the report which treats of the different varieties of small fruits will, it is hoped, be acceptable also to a large class of readers.

The comparative tests of varieties of beets, cabbage, celery, pease, peppers and tomatoes, as well as the results of the influence of certain fertilizers on the latter vegetable, will be a valuable guide to many.

Details concerning the distribution of seedling forest trees to the settlers on the North-West plains and to some other remote points for test will also be found in this report, with a brief summary of the results as far as they have yet been reported. Reference is also made to a further distribution of tree seeds and of small fruits for test in the more remote districts, where they are less easily obtainable through the ordinary commercial channels.

A report is also given of further experiments which have been carried on during the past year, with the use of fungicides, in the treatment of apple scab and grape and gooseberry mildews; also on the effect of using Paris green for the apple worm, mixed with the fluids to be used for the scab. Plain instructions, which any intelligent fruit-grower can follow, are given for the preparation of the various mixtures recommended.

REPORT OF THE CHEMIST.

The first division of this report gives the results of the analyses of 24 samples of soil from differents parts of the Dominion, many of them representing large areas in the localities from whence they were taken. One represents that part of the alluvial soil in the valley of the Fraser, in British Columbia, known as the delta lands Two analyses are reported on from the North-West Territories, one of black sandy loam, which is a sample of the black soil in what is commonly designated the fertile belt, the other the underlying subsoil. This formation is more or less continuous over a wide area of country from the western part of Lake Manitoba, through Prince Albert and Edmonton to the foot-hills of the Rocky Mountains. These samples are from Yorkton, Assa. Three others are alkaline soils from Manitoba and the North-West Territories. There are also included in the list soils from Ontario, Quebec and Nova Scotia.

Swamp mucks, muds and peats are referred to in Part 2, where the results of the analyses of twenty-one samples are given. These show that both muck and peat are usually of considerable value as fertilizers, and especially is this the case when they are composted with manure from the stable or barn yard. An analysis of gas liquor is also submitted, and its probable value as a fertilizer discussed. A considerable number of analyses of roots used as food for cattle are reported on, viz., of carrots, turnips, mangels and sugar beets. The results of some further work on corn are also given, showing its comparative value at different stages of growth; samples of ensilage have likewise been examined and their constituents determined.

The component parts of several samples of "condensed milk" of the most popular brands have also been ascertained. Tests have been made of the character and relative purity of twenty-nine samples of well water from farmers in different parts of the Dominion and information of much value furnished. Practical tests have also been made with mixtures of solution of soap and Paris green, with the view of determining whether a combination of this sort would lessen the poisonous effects of

the Paris green. The results show that this useful insecticide may be mixed with soap solutions without materially interfering with its strength.

REPORT OF THE ENTOMOLOGIST AND BOTANIST.

In the entomological part of this report attention is called again to the importance of spraying with Paris green and water for certain insect pests, and evidence is given of the fallacy of some statements lately made in an English paper as to the danger of using fruit from trees so sprayed. The facts cited by Mr. Fletcher show that no injury whatever can arise from such use.

Reference is made to damage during the past year caused by several injurious insects, among others, the Eye-spotted Bud Moth, which injures the apple tree; the Pear Leaf Blister, a small gall on the leaf of the pear produced by a very tiny mite; the Clover Root Borer, an insect not recorded as occurring in Canada before; and the Pea Weevil, which is said to be on the increase in some parts of the country. An account is also given of the occurrence of the Red Turnip Beetle, which attacks turnips and radishes in different parts of the North-West Territories.

The botanical portion contains an article on smut in grain with details of the most useful remedies. This will commend itself especially to the farmers of the North-West, where the "bunt" or "stinking smut" has of late been so prevalent and so detrimental to the crop.

In the experience given of the tests of native and foreign grasses at Ottawa during the past season, Mr. Fletcher has presented many useful facts. Some of the experiences of settlers in Manitoba who have tried some of these varieties is also related. This subject is deserving of careful attention and study.

A most important chapter to farmers is that on weeds. The necessity for information as to the proper treatment of these pests, with a view to their eradication, must be generally admitted. A weedy crop seldom gives satisfactory returns; the loss which arises depends partly on the fact that weeds take from the soil some of the elements of fertility which the growing crop requires, and also for the reason that the presence of numerous and thrifty-growing weeds prevents the free access of air and sunlight, so necessary to vigorous growth.

REPORT OF THE POULTRY MANAGER.

This report opens with a discussion of the subject of the winter laying of fowls, where some useful data is given with reference to the effects of different methods of feeding in the production of eggs. The breeds of fowls which have been found to lay best at the Central Experimental Farm during the winter are enumerated, and the proportion of eggs hatched from sittings of eggs of the various sorts of fowls is also given, with the most successful methods of treatment of the young chickens after they are hatched.

Particulars are given with regard to the dates at which the young pullets in the poultry house began to lay, showing that the White Leghorns, Wyandottes and Plymouth Rocks are among the earliest in this respect. The diseases of poultry are also discussed and remedies suggested. Further details are given of the examination of eggs long kept, which, with the results of the tests made last year, go to show that eggs when kept under the conditions described are not so perishable as is commonly supposed. These experiments have not as yet thrown much light on the question as to how eggs become offensive and putrid.

The important subject of the weight of eggs is dealt with at some length, and particulars are given of the weights per dozen of those from the fowls of all the leading breeds.

EXPERIMENTAL FARM, NAPPAN, N.S.

In the report of the superintendent of the experimental farm for the Maritime Provinces, the results of some instructive tests are given of varieties of wheat, many of which have yielded good returns. The crops which have been gathered from the

experimental plots of oats are exceptionally large, showing that the season has been very favourable at Nappan for this grain. Some large yields of barley have also been obtained, although most of the samples are deficient in weight.

The tests conducted with a number of different sorts of corn indicate that the growth of this useful crop for ensilage purposes in the Maritime Provinces is likely to be attended with success. The experiments with mangels, turnips and carrots have also been very successful.

The advantage resulting from the draining of so large a part of the land under cultivation begins now to be apparent in the increased crops.

The useful breeds of dairy cattle which have been provided at this experimental farm for the Maritime Provinces will, it is hoped, aid in the improvement of the stock of these provinces for dairy purposes, and will doubtless prove of special value to those farmers who are near enough to Nappan to avail themselves of the facilities for improvement which the presence of these animals will give.

EXPERIMENTAL FARM, BRANDON, MANITOBA.

In the report of the superintendent of this farm, Mr. S. A. Bedford, there will be found a large array of useful facts, the results of much careful work, which will be valuable to the settlers in Manitoba. The many tests with wheat, oats and barley, showing the length of time required to mature the different sorts, the varying results obtained by sowing on different classes of soil, by cutting the grain at different periods of ripeness; comparisons of the results of the use of the disc harrow with spring ploughing; of different methods of treating summer fallowed land; the use of different quantities of seed per acre; the relative returns from the use of the ordinary drill, the press drill and the broadcast seeder, and the yields from fall and spring ploughing, will all be read with much interest by the farmers of that province, as well as by those of the North-West generally. The results of experiments with smudges are also given in this report.

One of the most important series of results which Mr. Bedford has reported on relates to the growing of mixed grain, and cutting and curing it in the green state as hay for the winter feeding of cattle. The problem of supplying a sufficient quantity of winter food for the rapidly increasing herds of stock in the North-West was a pressing one, and the practical way in which it has been solved by the tests made at the experimental farms will have an important bearing on the stock and dairy interests of the future in these fertile portions of the Dominion. Mr. Bedford has shown that by sowing a mixture of oats and tares more than five tons per acre of nutritious hay can be produced in a favourable season, that such a crop can be sown after the grain is all in, and harvested before the grain harvest begins, and thus ample provision may be made by the use of comparatively few acres of land for the winter sustenance of a large herd of cattle.

The successful growing of fodder corn and the making of ensilage therefrom will prove another useful factor in developing the dairy interests of Manitoba, while the experiments with native and hardy imported grasses and clovers promise eventually to provide improved pasturage for the summer months. The satisfactory crops reported of mangels, carrots and turnips indicate that there need be no lack of variety in the food which can be stored for the winter feeding of cattle if farmers will only avail themselves of the advantages which the country offers.

The strains of dairy and beefing breeds of cattle which have been introduced during the past year at the Brandon experimental farm will it is believed offer good facilities for improving the stock in that part of the province. The use of frozen wheat and the coarser grains for feeding pigs and steers will also it is hoped show a more profitable way of disposing of these low-priced products at home than by shipping them out of the country.

Further reports on the tests of large and small fruits are also given, which are on the whole encouraging; so also are the results of further experiments with forest

and ornamental trees and shrubs. The preliminary lists which Mr. Bedford has prepared of the hardy, half hardy and tender sorts, as a guide to settlers who desire to ornament their homes or provide wind-breaks for their dwellings and out-buildings, are deserving of careful perusal by all who take an interest in this subject.

EXPERIMENTAL FARM, INDIAN HEAD, N.W.T.

The report of the experimental work carried on at the farm for the North-West Territories contains much that will be useful to the settlers who are farming in that part of the country. There are so many variations in climate on those vast plains that the results of tests made in eastern Assiniboia cannot always be repeated to the same advantage in Saskatchewan or Alberta, while other classes of experiments may be carried on with greater success. Nevertheless, much of the more important work which is being done at Indian Head under the superintendence of Mr. A. Mackay may be followed with advantage by the farmers in most parts of the Territories.

Much of the experimental work with grain which has been referred to when speaking of the farm at Brandon is being conducted on very similar lines at Indian Head. All the more promising varieties of cereals are being tested here, also the different systems of treatment and methods of cultivation, with the view of ascertaining what sorts of grain and what plan of procedure promises the best results.

In addition to what has been referred to, experiments have been made in sowing wheat at different depths in the soil, to ascertain the results of sowing different grades of frozen wheat as seed, comparing the returns from grain grown on land which has been fall ploughed with those from summer fallow, also the results of sowing after roots as against summer fallow. Smudges have also been tried as a protective measure against autumn frosts, and evidence submitted which shows that when a sudden drop in temperature of 8 or 9 degrees of frost takes place, as was the case at Indian Head, smudges are of no avail. Whether they will prove useful or not when the frosts are less severe has not yet been fully determined.

One of the most important series of experiments conducted at Indian Head during the past year is that with smutted grain. The "bunt" smut has been a very serious pest for many years past and has been more prevalent than usual during 1891. The wheat grown by many farmers which would otherwise have realized the best prices has, from this cause, been much depreciated in value, and in some instances become quite unsaleable. The total annual loss to the farming community in the North-West from smut is immense, and would be difficult to estimate. Mr. Mackay selected for his test one of the worst samples of smutty wheat to be found, and in sowing this untreated, about one-half of the crop consisted of smutted ears. By the use of blue stone (sulphate of copper) dissolved in water and applied to the grain in the proportion of one pound of the chemical to ten bushels of seed, the proportion of smutted heads was reduced to less than 15 per cent, and by using the same quantity in the treatment of five bushels the proportion was reduced to less than one per cent. Results very similar to these were obtained last year by Mr. Bedford at the Brandon experimental farm, and this disease may now be regarded as one which the farmer can himself control by taking the precautions referred to. The fact that smutty ears often occur in grain grown from seed believed to be quite free from smut would indicate that smut spores in the soil may attack the grain and bring on the disease. Seed treated with the sulphate of copper would in all probability be able to resist attack in this direction also. As no farmer would think of sowing seed so very smutty as that which was used in the experiment referred to, it is probable that the use of one pound of the sulphate of copper to ten bushels of seed grain would be sufficient to ensure almost entire freedom from this trouble.

Indian corn has not been found so satisfactory a crop at Indian Head as at Brandon; it has not attained the same weight of growth or degree of advancement. Excellent results have, however, been obtained by growing different mixtures of

grain to be cut green and cured for winter fodder; and this part of the report will be read with great interest by the farming community.

The tests with garden vegetables, fruits, forest trees and flowers, will prove a comparatively safe guide to those who desire to enter there on any of these branches of work. The stock department at the Indian Head farm is already beginning to demonstrate its usefulness, and has become an attractive feature in connection with the general experimental work.

EXPERIMENTAL FARM, AGASSIZ, B.C.

The report of the progress made at this farm is also very gratifying. Since the work was begun in August, 1889, 105 acres have been cleared of brush and stumps and brought under cultivation, 26 acres of which have been planted with fruit. Taking into consideration the condition of the land, the crops reported may be considered as very good.

The yield of wheat, barley and oats, sown in successive crops a week apart, for six weeks, seems to show that, as far as these cereals are concerned, there is no special advantage in early sowing in that part of British Columbia. During the early part of last year, when the weather was cold and wet, much of the seed early sown was injured by these unfavourable conditions; a repetition, however, will be needed of such experiments for several years, before any general conclusions can be drawn from them.

There being more than the usual amount of summer heat last year, the season was favourable for corn, and the crop of the heavier-yielding sorts ranged from 20 to 28 tons per acre. It is worthy of notice that the corn planted in hills, in nearly every instance, exceeded in weight of crop that sown in rows, showing the great advantage to the plants of plenty of air and light.

The yield of the plots of pease was quite phenomenal. The heaviest crop was given by the Mummy pea, 128 bushels 51¼ lbs. per acre; next in order was the Crown, with 116 bushels 15 lbs. per acre, closely followed by the Prince Albert, with 115 bushels and 25 lbs. per acre.

A new fodder plant which has been largely advertised, *Lathyrus Sylvestris Wagneri*, has produced seed quite freely at Agassiz, while at Ottawa it was almost an entire failure in this respect. The vines also made a very strong and vigorous growth, but Mr. Sharpe was unable to induce either the cattle or horses to eat any of it.

The crops of turnips, mangels, carrots and sugar beets have been excellent, and the heavy weights produced per acre of these succulent nutritive roots, and the ease with which they can be preserved in that mild climate, is a most encouraging indication of the future possibilities of dairying and stock-raising in British Columbia. The experimental plots of potatoes have also yielded remarkably well. The prevalence of rot in some of the varieties shows the importance of thoroughly testing the sulphate of copper as a remedy, which is now being so extensively used in Europe for this disease.

The results of the planting of fruits have been most encouraging. The growth of the trees has been very luxuriant, and it is expected that a large number of the varieties planted will bear fruit during the coming season. The future prospects for fruit production in that province are very bright, and no effort will be spared in the endeavour to made the testing grounds at the experimental farm as useful as possible to the settlers. From the particulars given by the superintendent in his report, it will be seen that examples of every promising sort which could be obtained are under trial there.

EXHIBITIONS.

Extensive collections of the products of the experimental farms were shown at several of the larger exhibitions. At Montreal an excellent display was made; so also at Toronto, London and Ottawa. These collections do not compete in any way with other exhibitors, and are so arranged as to make them as instructive as possible. In this way many farmers who visit these fairs become familiar

with the work of the experimental farms, and the opportunity is afforded them of seeing many new and useful varieties of farm products. For the preparation of these exhibits and the successful carrying out of the arduous task of putting them in place, and of giving information at the fairs to all enquirers, we are indebted mainly to the farm foreman, Mr. John Fixter, to my assistant in the experimental department, Mr. W. T. Macoun, and to the accountant, Mr. W. H. Hay. These officers have been untiring in their devotion to this work, and much of the success which has attended these exhibits has been due to their persistent efforts and to the taste and skill which they have shown in the arrangement of the displays.

Similar work has been carried on by the superintendents of the several branch farms, references to which will be found in their reports.

CORRESPONDENCE.

The following is a summary of the mail matter received and despatched at the Central Experimental Farm during the year 1891:—

—	Letters Received.	Letters Sent.
Director	7,544	5,256
Agriculturist and Dairy Commissioner	2,752	2,349
Horticulturist	891	1,307
Chemist	592	771
Entomologist and Botanist	1,894	1,727
Poultry Manager	363	356
Accountant	1,191	1,082
Total	15,227	12,848
Bulletins, reports, &c., sent out 203,353.		

This work is particularly heavy on all the officers during the early spring months, when the mails frequently bring to the office from 150 to 200 letters a day. Many of these require time and research to obtain the information asked, and it is not possible, with the limited staff available for the work, to answer every letter promptly, but answers are forwarded as fast as the work can be overtaken.

ACKNOWLEDGMENTS.

Before closing this report for the year, I take much pleasure in acknowledging my indebtedness to all the officers of the Central and branch experimental farms for the zeal they have manifested and the care they have exercised in bringing to a successful issue the different branches of work which have engaged their attention. To the foremen and employés acknowledgements are also due for faithful services. The valuable services rendered by the farm foreman, Mr. John Fixter, and my assistant in the experimental work, Mr. W. T. Macoun, deserves special commendation. To their constant vigilance and careful records I am again indebted for most of the particulars relating to the experimental work at the Central Farm. I desire also to again bear testimony to the useful service rendered by Mr. Wm. Ellis, who has had charge of the seed-testing house, also the care and propagation of the economic and other plants which are under cultivation, all of which has been managed with skill and has had much careful attention.

WM. SAUNDERS,
Director Experimental Farms.

REPORT OF THE AGRICULTURIST.

(Jas. W. Robertson.)

To Wm. Saunders, Esq.,
Director Dominion Experimental Farms,
Ottawa.

Sir,—I have the honour to report upon the progress of the work which has been under my charge at the Central Experimental Farm during 1891. The duties of my office, as Dairy Commissioner for the Dominion, engrossed the major share of my attention, and occupied the most of my time during the year. Attendance at conventions of farmers and dairymen—many of them of provincial nature and scope—in the several provinces of Canada, took me from home very frequently.

Upon the recommendation of the Honourable the Minister of Agriculture, the Government approved of the establishment of Experimental Dairy Stations, (1) for the purpose of investigating, by carefully conducted and repeated experiments, the methods and treatments in the manufacture of cheese during the summer, which yield the finest quality and the greatest quantity of cheese from the milk which is furnished by the patrons of factories, and (2) for the purpose of carrying on the manufacture of creamery butter at the same stations, during the other months of the year, in order to encourage farmers to obtain an income from their cows during every month, by supplying cream or milk to a creamery and by the raising of calves and pigs during the winter season. Parliament made provision for that undertaking in the appropriation for the work of the Dairy Commissioner. From March, 1891, preparatory arrangements in the different provinces were made. Supervision was given to the work of itinerant instructors in the provinces, where the dairy industry was not developed sufficiently to call for the establishment of Experimental Dairy Stations in 1891; and the management of two Experimental Dairy Stations in Ontario, and some experimental work in Quebec, were undertaken.

These tasks and duties, together with lectures at conventions of dairymen and farmers' institutes, required my absence from Ottawa for some part of every month, and for the greater part of all the months, except February and November. In all, 49 conventions or meetings, of from two to five sessions each, were attended during the year. They were distributed: Ontario, 19; Quebec, 8; New Brunswick, 2; Nova Scotia, 4; Prince Edward Island, 3; Manitoba, 3; North-West Territories, 1; British Columbia, 9. My assistants in the Dairy Commissioner's branch of the work attended and gave addresses at 242 meetings. The report of the Dairy Commissioner for 1891 (which can be obtained upon application by farmers and all others who are interested in agriculture), will present a brief yet fairly complete statement of progress.

The remainder of my time was available for the Central Experimental Farm, and was given to planning for and superintending experiments in (1) the feeding of steers for beef; (2) the economical feeding of milking cows; (3) the fattening of swine; (4) investigations in the experimental dairy; (5) the management of 40 acres of land, to determine how many cattle could be kept economically on that area; and (6) the growth of fodder corn and the making and feeding of ensilage.

Permit me to refer farmers, and others who may be seeking information on the other branches of the agricultural work—grain-growing, root-growing and general farm management—to your own report.

For the sake of clearness, and the convenience of those who may be seeking information and guidance from its pages, the matter to be presented has been grouped under the following heads:—

I. Cattle.—New purchases; general management; report on the feeding of steers; experimental tests in progress on the feeding and fattening of steers; investigations in the economical feeding of milking cows; short test to compare mangels with sugar-beets; and directions for the feeding of calves.

II. Swine.—New purchases; reports on the fattening of swine on steamed *vs.* cold, raw feed; on the feeding of pease ensilage to pigs; on the quantities of grain consumed per pound of gain in weight, at different stages of the feeding periods; and feeding tests in progress with skim-milk and frozen wheat.

III. Experimental Dairy.—Equipment of the building; tests in the separation of cream by different methods and treatments; experiments in the churning of cream at different stages of ripeness; experiments in the setting of milk and the making of butter from cows at different stages of lactation; the sterilizing of cream; and disposal of the dairy products.

IV. Forty-acre Lot.—Areas of different crops; yields of mixed crops and corn,

V. Fodder Corn and the Silos.—Varieties of corn; yields from different methods of planting; ensilage from corn; ensilage from mixed crops of cereals; ensilage from pease, rye and clover; the construction and filling of silos.

I have received indispensable assistance in carrying on the work and investigations, which are reported upon herein, from those who have attended to the details from day to day. Much of the thoroughness and reliability of experimental work, such as has been undertaken here, depends upon the faithfulness, watchfulness and care of those servants of the public whose names are seldom brought to its notice, to receive the due recognition and appreciation which the value of their services merits. For the work of so many hours per day, every man has received fair wages; but for that special quality of service and concern for the success of the work, which money cannot buy, I take this opportunity of making mention of Mr. John Fixter, Farm foreman; Mr. R. R. Elliott, Herdsman; and Mr. Chr. Marker, Butter-maker.

I have the honour to be, Sir,

Your obedient servant,

JAS. W. ROBERTSON,

Agriculturist.

PART I.—CATTLE.

To the herd of cattle, only a few thoroughbred animals were added by purchase during the year. They were almost immediately thereafter shipped to the branch experimental farm at Brandon, Man.

Shorthorn.

From Mr. W. S. Hawkshaw, Glanworth, Ont.:

One bull calf, General H.=14574=; red; calved 15th December, 1890; bred by W. S. Hawkshaw, Glanworth, Ont.; got by Aberdeen Hero (Imp.)= =;—dam, Countess of Hawkhurst=8752=; by 3rd Duke of Rutland=559=; Countess 2nd =784=; by Lord Ramsden=794=.

Holsteins.

From Messrs. A. C. Hallman & Co., New Dundee, Ont.:

One cow, Queen of Waterloo, No. 14666, H.F.H.B., No. 153, H.F.H.B.C.; calved 12th April, 1888; bred by A. C. Hallman & Co., New Dundee, Ont.; sire, African Prince, No. 1270, H.F.H.B.; dam, Mina Rooker 2nd, No. 3742, H.F.H.B.

One cow, Princess Leda 2nd, No. 18510, H.F.H.B., No. 141, H.F.H.B.C.; calved 6th January, 1889; bred by A. C. Hallman & Co., New Dundee, Ont.; sire, Netherland Monk, No. 4424, H.H.B.; dam, Princess Leda, No. 7130, H.F.H.B.

Ayrshires.

From Messrs. Kains Bros., Byron, Ont.

One bull, Middlesex—1216—; red and white; calved 10th September, 1890; bred by Kains Bros., Byron, Ont.; sire, Prince of Byron—583—; dam, Jeanie of Auchenbrain, (Imp.)—129—; by Duke 3rd—647—; Paisley, by Wallace of Drumlanrig —61—. From Messrs. David Morton & Sons, Hamilton, Ont.

One heifer, Dandy 2nd (imported in dam)—2004—; brown and white; calved 6th April, 1889; bred by Hugh Jack (Little Shewalton), Irvine, Scotland, imported by David Morton & Sons, Hamilton, Ont.; sire, Dandy Jim (1579); dam, Dandy 1st (5502), by Red Prince (1000).

One heifer, Jewel—2003—; white and brown; calved 14th June, 1889; bred by Hugh Jack (Little Shewalton), Irvine, Scotland; imported by David Morton & Sons, Hamilton, Ont.; Sire, Dandy Jim (1579); dam, Judy (Imp.) (5505); by Red Prince (1000).

Galloways.

We exchanged a bull calf which we had received in 1890 from Mr. Thomas McCrae, Guelph, Ont., for one bull, Chester (4472) 6760; calved March, 1887; bred by D. McCrae, Guelph, Ont.; sire, Stanley III of Drumlanrig (Imp.) (1793) 2833; dam, Chrissy (Imp.) (7099) 2587; by Chipperkyle (2332).

The four animals of the Galloway breed, which we had at the Central Experimental Farm, were sent to the Brandon farm, together with four Shorthorns and one young Holstein bull.

Grade Steers.

In October, 1891, sixteen grade steers were purchased for the carrying on of investigations into the effects of different rations for the feeding and fattening of cattle.

General Management.

Summer.—The hours of the stablemen were from 6 a.m. to 6 p.m., and four hands were employed. The assistant from the experimental dairy fed the calves. The bulls, part of the cows and the calves, were kept in the stables and fed on green fodders. The area of pasture land has been small for the number of cattle which have been kept. The animals not in the stables were inspected, and fed allowances of green fodder every day during the greater part of the season. The same hands looked after the experimental piggery and fed from 20 to 40 pigs.

Winter.—The hours of the stablemen are from 6 a.m. to 5 p.m., and six hands are employed. Experiments in feeding are in progress, with 25 cows, 21 steers and 36 swine. Nine different rations are fed daily to cows, steers, bulls and calves. The quantity of feed consumed daily, by each animal, or group of animals, is weighed and recorded. The stalls and gutters in the main stable are cleaned out twice daily; the box stalls are cleaned out every second day. The cattle are curried daily, with a few exceptions; and the udders of the milking cows are brushed carefully before each milking. All the breeding and other animals—which are not weighed oftener in some special test—are weighed once every month.

Abortions.

During 1890 the disease of epidemic abortion was reported as prevailing in the herd. The method of treatment, which was then adopted, was described:—

I. The stables were thoroughly fumigated by the burning of sulphur, saturated with alcohol, with the doors and windows closed for three hours. Of course, all the cattle were out.

II. A wash was made up of 1 part of bichloride of mercury to 4,000 parts of water, into which solution were put 8 ounces of common salt; once a day the bare skin around the vulva, the anus and the root of the tail of the cows in calf, and also of those which had aborted, were sponged with the solution.

III. After several weeks of that treatment, the following was adopted as being preferable: $2\frac{1}{2}$ drachms of bichloride of mercury were dissolved in $3\frac{1}{4}$ ounces of glycerine and $3\frac{1}{4}$ ounces of alcohol; after these had united, $4\frac{1}{2}$ gallons of rain water were added. (The mixture should be kept in a wooden vessel, out of the reach of irresponsible persons, and animals). The bare skin under the tail and around that part was moistened once a day with the solution.

IV. The cows, which formerly had been turned out into a large yard every day for water, were watered from troughs in front of their stalls.

V. When a pregnant cow showed any sysmptoms of approaching abortion—and these are, slight relaxation of the muscles surrounding the vulva, restlessness and a continuous slight elevation of the tail—she was at once put into a box stall, where she was free from disturbance or causes of excitement. One-ounce doses of tincture of opium were given in the feed—even three times a day for one or two days until a quiet and slightly sluggish condition prevailed. Drenching with medicine was avoided.

The result is—and it is mentioned with hesitation and fear, lest the dread abortions should occur again—that since the system of treatment has been adopted 13 cows have given safe delivery to calves at the natural time, and only one case of abortion has occurred, and that could be accounted for satisfactorily. That covers a period of three and a-half months. During the preceding ten months there were 13 births at the natural time, and 14 prematurely, at from four and a-half to eight months.

The preceding six paragraphs have been copied from my report of 1890. During 1891 the number of births at the natural time was 34. There were 3 cases of abortion; one of these was that of a cow which had a similar misfortune last season; another of the cases could be accounted for afterwards, in so far as it was discovered that the cow was affected with an incurable disease, which had a tendency to provoke uterine disorders; the third case was that of a grade heifer, and for it no satisfactory reason could be assigned. There were also two cases of still-born calves.

Lice on Cattle.

Government property has no greater immunity from the attacks of parasites than that of private individuals, and during the winter of 1890-91 some of the cattle became infested with lice. That fact is mentioned for the purpose of stating that a most effective, safe and simple treatment can be given by applying a kerosene emulsion. The method of preparation is described thus in Bulletin No. 11, prepared by Mr. Fletcher, Entomologist:—

Kerosene (coal oil)..	2 gallons
Rain water..	1 do
Soap	$\frac{1}{2}$ pound

"Boil the soap in the water till all is dissolved; then, while boiling hot, turn it into the kerosene, and churn it constantly and forcibly with a syringe or force pump for five minutes, when it will be of a smooth, creamy nature. If the emulsion be perfect it will adhere to the surface of glass without oiliness. As it cools it thickens into a jelly-like mass. This gives the stock emulsion."

For use on the cattle it was diluted with 18 times its measure of water. Besides killing the lice, it seemed to have a beneficial action on the hair and skin. One-quarter of the quantity mentioned above is sufficient for a large herd.

Dehorning.

On 3rd December the operation of dehorning was performed on 4 three-year old steers, and on one Jersey bull five years old.

Through questions which have been asked at conventions and farmers' institutes, and by letters which have been received, an opinion has been asked repeatedly during the past two years upon the subject of dehorning cattle. Farmers who have sufficient open-shed or closed-in-shed convenience for the fattening of steers if they could be allowed to run loose with safety, have made frequent applications for information. The practice has become common in many of the States of the Union.

The references which have been made to it in the columns of the agricultural press provoked further curiosity and interest on the part of Canadian farmers, to learn from some authoritative source in Canada what effect the operation would have. The mode of procedure was to put each steer into the sling which we use for lifting the bulls when the hoofs are to be trimmed. The neck was fastened securely between two upright pieces of scantling, one of which was movable at the top, after the style of the common old-fashioned stable stanchion. The head was then tied to one side. The hair around the base of each horn was clipped off, to permit the cutting to be effected in such a way as to remove a narrow ring of skin with the horn. Leavitt's dehorning machine was used on two horns. It is constructed in such a way as to clip the horn off at one snap. In the case of three-year-old steers, the horns were too hard and tough for one man to use the machine with sufficient quickness of motion. For the other horns, a common fine-toothed carpenter's saw was used.

The operation on each horn lasted from one quarter to one half of a minute. In the case of two of the steers, the saw cut through an artery, from which a small jet of blood spurted. The wounds on the heads of two of the steers, appeared to be acutely painful for nearly a week; the other two animals did not appear to suffer any inconvenience after the operation was ended. It was not expected that blood would flow so freely from the wounds as it did in the two cases mentioned, and no particular preparation had been made to staunch the flow at once. A cloth covered with coal-tar, is probably one of the most accessible and suitable applications which can be made on the ordinary farm. The steers have been fed in box stalls, running loose in pairs, and they seem to be most healthy and gentle since the wounds healed.

In the case of the Jersey bull, he had become so vicious that the attendants went into his box-stall only at the jeopardy of their lives. Instructions had been given several months previously that no one was to go into his box-stall until after he had been securely tied. For the dehorning operation, the bull was tied in a similar manner to the steers. His horns were sawn off as close to the skull as possible. Not a thimbleful of blood altogether was shed; and when he was turned loose in his box-stall he acted as mildly as a sheep.

A full report on the feeding of the dehorned steers will appear after the completion of the experiment, which is expected to last until after April, 1892.

The Feeding of Six Steers.

Six steers were purchased for feeding purposes in November, 1890. They were a fairly even lot of two-year-olds, and apparently were grades of Shorthorns. On 1st December, 1890, the average weight was 1,135 lb. each. They were weighed every week, and all the feed which they consumed was weighed every day. They had free access to water in a trough in front of the stalls, and a supply of salt was provided at one side of each manger. The following Table shows the weight of each steer on 1st December, 1890, and every four weeks thereafter until 18th May, 1891.

—	Dec. 1.	Dec. 29.	Jan. 26.	Feb. 23.	Mar. 23.	April 20.	May 18.	Total Gain
Steer No. 1	1,220	1,305	1,355	1,390	1,420	1,486	1,493	273
" No. 2	1,120	1,195	1,200	1,256	1,255	1,350	1,374	254
" No. 3	1,037	1,096	1,102	1,188	1,199	1,235	1,317	280
" No. 4	1,170	1,230	1,263	1,310	1,336	1,385	1,442	272
" No. 5	1,225	1,302	1,308	1,361	1,386	1,396	1,430	205
" No. 6	1,040	1,081	1,108	1,175	1,207	1,257	1,263	223

The rate of increase in weight was not nearly so rapid as it might have been if all the animals had been fed in a stable, where they could feed and lie undisturbed. In our stable there is such a succession of visitors that the animals are disturbed, I suppose, a dozen times daily. The disturbances and consequent unfavourable conditions were alike for all the animals, and did not interfere with the fairness of the comparison, although they did hinder the rapidity of the fattening.

The six steers were fed on the same ration until 29th December. They were divided into three lots of nearly equal age and weight, and evidently of similar breeding. The main object of the test was to discover the value of corn ensilage as compared with common hay. One lot of steers were fed on a ration composed of hay, roots and meal; another lot of steers were fed on a ration of corn ensilage, with the same kind and quantity of meal; and the third lot of steers were fed on a ration consisting of corn ensilage, hay and roots, and an equal quantity of meal of the same quality as the other two rations contained.

The compositions of the rations were as follows:—

First Lot of Steers, Nos. 1 and 2:

	Lb.
Hay	20
Turnips	40
Straw	5
Chopped barley	2
do pease	2
Ground oil-cake	1
Cotton-seed meal	1
	71

For a period of five weeks, from 17th March to 20th April, one pound each of oil-cake and cotton-seed meal were added to the ration.

For the whole period of 20 weeks, from 29th December to 18th May, each steer consumed an average of 55·5 lb. per day.

Second Lot of Steers, Nos. 3 and 4:

	Lb.
Corn ensilage	50
Straw	5
Chopped barley	2
do pease	2
Ground oil-cake	1
Cotton-seed meal	1
	61

For a period of five weeks, from 17th March to 20th April, one pound each of oil-cake and cotton-seed meal were added to the ration.

For the whole period of 20 weeks, from 29th December to 18th May, each steer consumed an average of 60 lb. per day.

Third Lot of Steers, Nos. 5 and 6:

	Lb.
Corn ensilage	20
Turnips	20
Hay	10
Straw	5
Chopped barley	2
do pease	2
Ground oil-cake	1
Cotton-seed meal	1
	61

For a period of five weeks, from 17th March to 20th April, one pound each of oil-cake and cotton-seed meal were added to the ration.

For the whole period of 20 weeks, from 29th December to 18th May, each steer consumed an average of 52·8 lb. per day.

For the purpose of making a comparison between the actual cost of feeding steers on the three different rations, a market value was estimated for the component fodders in each. The hay was valued at $8 per ton; roots (turnips or mangels) at $4 per ton; straw at $4 per ton; pease and barley at $20 per ton; and cotton-seed meal and oil-cake at $30 per ton. The corn ensilage cost $1.40 per ton, as per statement in Bulletin No. 12, issued by Prof. Saunders in June, 1891. It will be observed that the corn ensilage was placed at cost, and the other fodders at an estimated market price; but it will not be considered by farmers, in many districts in Canada, that they can produce hay at a cost below $8 per ton, or roots below $4 per ton.

The following Table shows (1) the increase in weight of the steers in 20 weeks; (2) the quantity of feed consumed per day, and (3) the cost per head per day for feed:—

TABLE II.

—		Ration.	Increase in Weight.	Average feed consumed per day.	Average cost of feed per day.
			Lb.	Lb.	Cents.
First lot	No. 1	Hay, roots and meal	188	55·5	19·23
	No. 2	do do	179		
Second lot	No. 3	Corn ensilage and meal	221	60·	11·90
	No. 4	do do	212		
Third lot	No. 5	Hay, roots, corn ensilage and meal.	128	52·8	15·58
	No. 6	do do do	182		

All the steers were allowed as much feed as they could eat up clean; and the quantity was varied from time to time, as they would eat more or less.

It may be mentioned, in explanation of the small increase in weight of steer No. 5, that he did not thrive well, part of the time. That could not be accounted for satisfactorily. He seemed to be healthy, but, as everyone who has fed cattle knows, an animal "will go off his feed" occasionally and will not thrive.

It will be observed that the steers fed on the corn ensilage and meal ration gained an average of 33 lb. each more than those on the ration of hay, roots and meal, during the 20 weeks.

During the last month of the testing period steers No. 3 and 4, on corn ensilage and meal, gained in weight much faster than the others; and when the experiment was finished they were in more attractive condition for handling and selling.

Table III shows the quantities of the digestible constituents in the feed, consumed by the several lot of steers, as calculated from the following table, which is reproduced from the report of 1890 :—

QUANTITIES of Digestible Protein, Carbo-hydrates and Fat, in each pound of certain Feeds, from tests with ruminants—(Oxen and Cows.)

—	Total Dry Organic Matter.	Digestible Protein.	Digestible Carbo-hydrates.	Digestible Fat.
	Lb.	Lb.	Lb.	Lb.
Wheat.......... 1 lb.	·89	·095	·588	·014
Barley.......... do	·89	·094	·600	·026
Oats.......... do	·87	·080	·440	·044
Pease.......... do	·87	·201	·534	·029
Oil-cake.......... do	·92	·283	·368	·050
Cotton-seed meal.......... do	·92	·336	·264	·070
Wheat bran.......... do	·87	·117	·453	·027
Mixed straw (wheat, barley, oat).......... do	·85	·035	·330	·004
Mixed hay.......... do	·86	·051	·430	·012
Corn ensilage.......... do	·25	·016	·230	·006
Corn stover.......... do	·48	·033	·480	·008
Turnips.......... do	·085	·010	·075	·001
Mangels.......... do	·120	.011	·100	·001
Carrots.......... do	·141	.013	·115	·002
Sugar beets.......... do	·185	.010	·167	·001

TABLE III, showing the average quantities consumed, per day, by the two Steers in each lot.

—	Rations.	Total Dry Organic Matter.	Digestible Protein.	Digestible Carbo-hydrates.	Digestible Fat.
		Lb.	Lb.	Lb.	Lb.
First lot, steer No. 1.. / do No. 2..	Hay, roots and meal	47·64	4·60	25·34	·87
Second lot, steer No. 3. / do No. 4.	Corn ensilage and meal....	44·04	4·55	31·65	1·13
Third lot, steer No. 5.. / do No. 6..	Hay, roots, corn ensilage and meal..........	43·62	4·41	25·98	·93

Experiments in Progress.

At the present time, experiments are in progress with twenty steers :

Three-year-olds.—Two steers which were dehorned are being fed in a loose box (where the temperature is almost as low as in a shed with single board sides) on a ration of—

	Lb.
Corn ensilage	50
Straw	5
	55

Two steers of the same age and similar quality, also dehorned, are being fed in a like manner, on a ration of—

	Lb.
Corn ensilage	50
Straw	5
Oil-cake	2
Ground pease	2
do barley	2
	61

Two-year-olds.—Two steers are being fed upon each of the following rations :

No. 1.	Lb.	No. 2.	Lb.	No. 3.	Lb.	No. 4.	Lb.
Corn ensilage	20			Corn ensilage	50	Corn ensilage	50
Hay	10	Hay	20				
Roots	20	Roots	40				
Straw	5	Straw	5	Straw	5	Straw	5
Oil-cake	2	Oil-cake	2	Oil-cake	2	Frozen wheat	6
Ground pease	2	Ground pease	2	Ground pease	2		
do barley	2	do barley	2	do barley	2		
	61		71		61		61

Yearlings.—Two yearling steers are being fed in a loose box, similar to those used for the three-year olds, on ration No. 3; and two other steers of equal age are being fed on the same ration in the ordinary stable.

Calves.—Two steer calves—one Shorthorn grade and one Quebec Jersey grade—are being fed on ration No. 2; and two steers of an equal age, and similar breeding, are being fed on ration No. 3.

These experiments will furnish data, also, upon the number of pounds gained in weight, and the quantity of feed consumed per pound of increase in live weight, by *three-year-old*, *two-year-old*, *yearling* and *calf* steers, respectively, when fed upon the same ration.

The Feeding of Milking Cows.

The object of this test was to discover the effect of substituting corn ensilage for hay and roots, and also the effect of substituting hay and roots for corn ensilage in the ration of milking cows. A study was also made of the economic effect of feeding different quantities of ground grain and meal in the rations. Eighteen milking cows were selected. For one week they were all fed upon a ration composed of—

	Lb.
Corn ensilage	25
Roots (carrots, mangels)	20
Straw (oat and barley)	10
Bran	3
Meal (pease, barley, oats)	2
Cotton-seed meal	2
	62

Each animal was allowed as much of the mixture as it would eat every day. Twelve of the cows (afterwards Lots 1, 2, 3 and 4) were fed twice a day; and six of the cows (afterwards Lots 5 and 6) were fed three times daily. The eighteen cows were divided into three groups of six cows each. The six cows of each group were again divided into two lots of three cows each. The cows in each lot were arranged in such a way that the cows in the one lot of each group, were of nearly equal weights, milking capacity and period of lactation, with the cows of the other lot in the same group. For the first four weeks of the experiment eight tests of the morning and eight tests of the evening milk of each cow, were made with the Babcock milk tester, to determine the percentage of fat. Only four tests of the morning milk and four tests of the evening milk of each cow, were made during the second feeding period, after which the testing apparatus was unexpectedly required for the work of the travelling dairy instructors. The tests, which had been made, twice of morning milk and twice of evening milk, of each cow, every week, had shown such wide variations and unaccountable fluctuations in the quality of the milk of the same cows that it was decided that the data on the percentage of fat in the milk could not be considered reliable unless the milk were tested every day.

A series of experiments to discover the effect of the quality of the feed upon the percentage of the solid constituents in the milk of 25 cows has been undertaken since, and will be reported upon when it is concluded. At the time of writing, enough information has been secured to warrant the statement that a progressive increase in the richness of the ration, by the addition of one pound of meal per cow per day, every fortnight, does not appear to have any appreciable effect towards increasing the percentage of solids in the milk, within three months.

The Cows of Group I., Lot 1 (Daisy, Pinkie, Blossom) were grade Shorthorns, and at the commencement of the test—23rd March, 1891—had been milking for an average period of 46 days. The average weight of the cows was 1,195 lb. each.

First Period.

rom 23rd March to 19th April the three cows of Group 1, Lot 1, were fed on ration 1, which was composed as follows:—

	Lb.
Corn ensilage	60
Wheat bran	2
Chopped pease	2
Oil cake	2
Cotton-seed meal	2
	68

Of that mixture each cow consumed an average of 92·7 lb. per day. The 92·7 lb. of the mixture contained 10·9 lb. of the mixture of bran, chopped pease, oil-cake and cotton-seed meal. The cost per day was calculated on the same basis of valuation as was used in the tests in the feeding of steers, viz.:—hay at $8 per ton; roots at $4 per ton; wheat, bran, pease and barley at $20 per ton; and cotton-seed meal and oil-cake at $30 per ton. Corn ensilage cost $1.40 per ton, as per statement in Bulletin No. 12, issued by Prof. Saunders in June, 1891. Upon that scale of values, the cost per day was 19·37 cents per cow for feed.

The average quantity of milk, which had been yielded by the three cows during the weeks which preceded this test—1st March to 22nd March—was 28·3 lb. each per day. From 23rd March to 19th April the average quantity of milk was 28·94 lb. per cow per day.

The average quality of the milk, as determined by eight tests of morning milk and eight tests of evening milk of each cow, showed 3·52 per cent of fat.

The animals weighed an average of 1,195 lb. each at the commencement, and an average of 1,207 lb. each at the end of the four weeks.

Second Period.

After the feeding of the ration 1, for four weeks, the quantity of corn ensilage was increased to 90 lb., with the same quantity of meal as before. The ration as then arranged was:—

	Lb.
Corn ensilage	90
Wheat bran	2
Chopped pease	2
Oil-cake	2
Cotton-seed meal	2
	98

Of that mixture each cow consumed an average of 95 lb. per day, which contained 7·7 lb. of the meal mixture—bran, chopped pease, oil-cake and cotton-seed meal.

The cost per day was 15·77 cents per cow, or 3·6 cents per cow less than in the former case.

The average quantity of milk was 26 lb. per cow per day.

The animals weighed an average of 1,200 lb. each at the end of the four weeks.

Third Period.

During the third period of fo weeks the ration was:—

	Lb.
Corn ensilage	40
Hay	20
Bran	2
Chopped pease	2
Oil-cake	2
Cotton-seed meal	2
	68

Of that mixture each cow consumed an average of 53·6 lb. per day, which contained 6·3 lb. of the meal mixture—bran, chopped pease, oil-cake and cotton-seed meal.

The cost per day was 16·4 cents per cow.

The average quantity of milk was 21·7 lb. per cow per day.

The animals weighed an average of 1,234 lb. each at the end of the four weeks

The extended explanations which have been given in presenting the facts of feeding the cows of Lot 1, for the three periods of four weeks each, apply to the other lots of cows.

The following Tables present the facts for convenient comparisons:—

TABLE I.—Group I, Lot 1, (Daisy, Pinkie, Blossom).—Three grade Shorthorn cows. At 23rd March, when the first period of the test began, the average length of time from the commencement of their milking period was 46 days.

Composition of Ration.	Preparatory Period of one week.	First Period of four weeks.	Second Period of four weeks.	Third Period of four weeks.
Corn ensilage.............. Lb.	....	60	90	40
Hay.............. "	....	....	....	20
Root (mangels or carrots).............. "	....	....	....	....
Meal (equal parts by weight of wheat bran, ground pease, oil-cake and cotton-seed meal).. "	....	8	8	8
	....	68	98	68
(For composition of ration for preparatory period, see page 72).				
Quantity consumed per cow, per day.......... Lb.	57·	92·7	95·	53·6
do of meal, per cow, per day.......... "	....	10·9	7·7	6·3
Value of feed consumed, per cow, per day.. ...Cents.	....	19·37	15·77	16·40
Average quantity of milk, per cow, per day.... Lb.	28·3	28·94	26·06	21·74
do percentage of fat in milk.......... p.c.	....	3·52	....	....
do live weight per cow at beginning..... Lb.	1,175	1,195	1,207	1,200
do do do end.......... "	1,195	1,207	1,200	1,234
Value of feed consumed per 100 lb. of milk produced..........Cents.	....	66·93	60·51	75·43

TABLE II.—Group I, Lot 2 (Blue-Bell, Buttercup, Pansy).—Three grade Shorthorn cows. At 23rd March, when the first period of the test began, the average length of time from the commencement of their milking period was 45 days.

Composition of Ration.		Preparatory Period of one week.	First Period of four weeks.	Second Period of four weeks.	Third Period of four weeks.
Corn ensilage	Lb.	....	30	40	90
Hay	"	....	15	20	....
Roots (mangels or carrots)	"	....	....	....	....
Meal (equal parts by weight of wheat, bran, ground pease, oil-cake and cotton-seed meal.)	"	....	8	8	8
			53	68	98
(For composition of ration for preparatory period, see page 72.)					
Quantity consumed per cow, per day	"	57	68	53	90
do meal per cow, per day	"	....	10·2	6·2	7·3
Value of feed consumed per cow, per day	Cents.	....	23·19	16·22	14·94
Average quantity of milk per cow, per day	"	26·8	28·47	27·1	23·87
do percentage of fat in milk	p.c.	....	3·50	....	....
do live weight per cow at beginning	Lb.	1,211	1,214	1,247	1,250
do do end	"	1,214	1,247	1,250	1,249
Value of feed consumed per 100 lb. of milk produced	Cents.	....	81·45	59·85	62·58

TABLE III.—Group II, Lot 3 (Barberry, Clenna Rex, Countess).—Two Jersey and one Ayrshire cows. At 23rd March, when the first period of the test began, the average length of time from the commencement of their milking period was 151 days.

Composition of Ration.		Preparatory Period of one week.	First Period of four weeks.	Second Period of four weeks.	Third Period of four weeks.
Corn ensilage	Lb.	....	60	90	90
Hay	"	....	....	....	....
Roots (mangels or carrots)	"	....	....	....	....
Meal (equal parts by weight of wheat bran, ground pease, oil-cake and cotton-seed meal)	"	....	....	4	8
		....	60	94	98
(For composition of ration for preparatory period, see page 72.)					
Quantity consumed per cow, per day	"	44·	60·	66·3	65·
do of meal per cow, per day	"	....	....	2·9	5·3
Value of feed consumed per cow, per day	Cents.	....	4·2	7·95	10·79
Average quantity of milk per cow, per day	Lb.	13·9	10·75	11·32	12·58
do percentage of fat in milk	p.c.	....	4·65	....	....
do live weight per cow at beginning	Lb.	856	854	827	812
do do end	"	854	827	812	856
Value of feed consumed for 100 lb. of milk produced	Cents.	....	39·06	70·22	85·77

TABLE IV.—Group II, Lot 4 (Maggie B., Clenna Rex II).—One Ayrshire and one Jersey cow. (The other Jersey cow was taken sick and was dropped out.) At 23rd March, when the first period of the test began, the average length of time from the commencement of their milking period was 172 days.

Composition of Ration.		Preparatory Period of one week.	First Period of four weeks.	Second Period of four weeks.	Third Period of four weeks.
Corn ensilage	Lb.	....	60	90	90
Hay	"	....	....	....	....
Roots (mangels or carrots)	"	....	....	....	....
Meal (equal parts by weight of wheat bran, ground pease, oil-cake and cotton-seed meal)	"	....	8	8	4
		....	68	98	94
(For composition of ration for preparatory period, see page 72.)					
Quantity consumed per cow, per day	"	47	74·5	70·8	66·7
do of meal per cow, per day	"	....	8·7	5·7	2·8
Value of feed consumed per cow, per day	Cents.	....	15·57	11·75	8
Average quantity of milk per cow, per day	Lb.	17·6	18·18	18·49	14·12
do percentage of fat in milk	p.c.	....	4·58	....	....
do live weight per cow at beginning	Lb.	846	833	869	881
do do at end	"	833	869	881	898
Value of feed consumed per 100 lb. of milk produced	Cents.	....	85·64	63·54	56·62

TABLE V.—Group III, Lot 5 (Dorinda II, Dorinda III, Aaggie's Cornelia). Three Holstein cows. At 23rd March, when the first period of the test began, the average length of time from the commencement of their milking period, was 150 days.

Composition of Ration.		Preparatory Period of one week.	First Period of four weeks.	Second Period of four weeks.	Third Period of four weeks.
Corn ensilage	Lb.	....	40	100	....
Hay	"	....	....	....	40
Roots (mangels or carrots)	"	....	30	30	30
Meal (equal parts by weight of wheat bran, ground pease, barley, oil-cake and cotton-seed meal)	"	....	10	10	10
		....	80	140	80
(For composition of ration for preparatory period, see page 72.)					
Quantity consumed per cow, per day	Lb.	54	134·6	122·3	48·3
Quantity of meal per cow, per day	"	....	16·8	8·7	6·0
Value of feed consumed per cow, per day	Cents.	....	34·99	21·89	20·53
Average quantity of milk per cow, per day	Lb.	28·6	31·76	29·30	25·12
do percentage of fat in milk	p.c.	....	3·56	....	....
do live weight per cow at beginning	Lb.	1,175	1,094	1,255	1,220
do do at end	"	1,094	1,255	1,220	1,204
Value of feed consumed per 100 lb. of milk produced	Cents.	....	110·17	74·70	81·72

TABLE VI.—Group III., Lot 6 (Miss Elgins, Fashion Book, Cherry Constance). Three Shorthorn cows. At 23rd March, when the first period of the test began, the average length of time from the commencement of their milking period was 121 days.

Composition of Ration.	Preparatory Period of one week.	First Period of four weeks.	Second Period of four weeks.	Third Period of four weeks.
Corn ensilage .... Lb.	......	......	......	100
Hay .... "	......	20	40	......
Roots (mangels or carrots) .... "	......	30	30	30
Meal (equal parts by weight of wheat bran, ground pease, barley, oil-cake and cotton-seed meal) .... "	......	10	10	10
	......	60	80	140
(For composition of ration for preparatory period, see page 72.)				
Quantity consumed per cow, per day .... "	57·	67·2	46·6	101·
Quantity of meal per cow, per day .... "	......	11·2	5·8	7·2
Value of feed consumed per cow, per day .... Cents.	......	29·1	19·8	18·
Average quantity of milk per cow, per day .... Lb.	23·5	25·63	20·76	18·14
do percentage of fat in milk .... p.c.	......	3·75	......	......
do live weight per cow at beginning .... Lb.	1,300	1,295	1,342	1,342
do do at end .... "	1,295	1,342	1,342	1,290
Value of feed consumed per 100 lb. of milk produced .... Cents.	......	113·53	95·37	99·22

The teaching of the experiment points to the economy of:—

(1) Providing for milking cows a ration of succulent quality;

(2) Feeding as large a quantity of the feed as the animals will eat up clean; and

(3) Making the ration of such a gross and bulky composition that not more than from 6 to 8 pounds of meal—the concentrated and expensive part of the feed—will be consumed by the ordinary cow per day.

Corn ensilage of such quality as came from our silos was not in itself a complete or suitable feed for milking cows. During the period when it was fed alone the hair of the cows seemed dry, there was an absence of thrifty appearance, and the yield of milk fell off in the first period of four weeks by 22·6 per cent. There was an average gain in the yield of milk during the first period of four weeks, from the cows in each of the other five lots, of 6·5 per cent.

Feeding Mangels vs. Sugar-beets for a Short Period.

An experiment to last for three weeks was undertaken on 7th December, to discover if any immediate and perceptible influence on the quantity and quality of the milk resulted from feeding sugar-beets in a ration, in place of mangels.

Twenty-three milking cows were in three groups, according to their periods of lactation, for the experimental dairy tests reported upon in Tables V to X of the dairy experiments recorded in Part III of this report.

The ration fed from 7th to 13th December was composed of:—

	Lb.
Corn ensilage	40
Mangels	35
Straw	5
Meal (barley, pease, oats)	5
	85

The ration fed from 14th to 27th December was composed of:—

	Lb.
Corn ensilage	40
Sugar beets	35
Straw	5
Meal (barley, pease, oats)	5
	85

The milk was carefully weighed, the specific gravity was taken by the lacto-densimeter, and the percentage of fat was ascertained by the Babcock milk tester. The following Table shows the average results:—

TABLE VII.

—	From Mangels.		From Sugar Beets.	
	Morning Milk.	Evening Milk.	Morning Milk.	Evening Milk.
Average quantity of milk ..... Lb.	8·29	6·48	7·72	5·42
do specific gravity	1,033·08	1,032·91	1,033·27	1,033·54
do per cent of fat in milk ..... p.c.	4·13	4·76	4·16	4·75

This experiment does not indicate that there was any appreciable difference in the quantity or richness of the milk, due to the substitution of sugar-beets for mangels. An examination of the butter which was made revealed the fact that the butter made during the period when sugar-beets were fed had a firmer body and a finer flavour than that which was made during the period when mangels were being fed.

Feeding Calves.

Very many enquiries have come to the office by mail, asking for information and advice on the feeding and raising of calves for the dairy. At my suggestion one of my assistants in the Dairy Commissioner's branch, Mr. J. W. Hart, prepared the following short article on that subject. Mr. Hart has proven by his work that he has special aptitude and ability in the care of dairy stock; and I consider the matters of advice contained in his article to be so much to the point, and capable of so much service to the stock-raisers of Canada, that I introduce it here in his own bright language.

(Written by J. W. Hart).

A knowledge of the principles which underlie the science of feeding will materially aid any one who essays to raise dairy stock; and no class of stock upon the farm will more fully respond to judicious, intelligent and generous treatment than will the calves. No saving can be effected by stinting calves in their feed. The man who starves his young stock through greed of gain, and in accordance with his false notions of economy, is not a capable stock-raiser or feeder. Aside from a humanitarian standpoint, what shall it profit a man if he feed a calf twelve months to attain a weight that could have been laid on in one-half the time? A stunted, dejected-looking calf, and the loss of the food necessary to maintain its miserable existence for six months is the ordinary result. Nor is this all. If the calf be raised for the dairy it will seldom outlive the effects of its early treatment. The difference between what such a cow is, and what she might have been—extending over a period of years, and to her offspring—will keep hundreds of dollars out of the stock-raiser's pocket.

The feeding of a calf commences before the calf is dropped. Before calving, the cow should be fed liberally with suitable food, that the calf may be strong and vigourous, and the flow of milk large.

"Milk is the natural food of the young of all mammalia." But, except in a few instances (and they are rarer than many of our breeders of thoroughbred stock suppose), milk—the model and perfect food—is too expensive a diet for the calves. Therefore, some owners of cows knock the calves on the head; but others prefer to raise them. The object of this article is to show how this may be accomplished with profit. I would not advise any one to raise all the calves dropped in his herd. It matters not how excellent the herd may be, there will be some weakly calves, and calves from the poorest milkers, that cannot be raised with profit or advantage.

Milk being a perfect food, supplying all the elements necessary for the growth of bone, muscle, nerve and sinew, for repairing waste and maintaining the animal heat, "it must follow as the night the day," that the more closely we can get our substitutes to resemble milk, in character and composition, the more rational and correspondingly successful will our practice be. The following is an average of a number of analyses of milk:—

Water	87·25	per cent.
Fat	3·50	do
Albuminoids	3·90	do
Sugar	4·60	do
Ash	·75	do

In this article I shall not attempt a description of these constituents and their functions in the animal economy. If the fat be taken from the milk in the form of butter it should be replaced by a cheaper food, rich in fat. Flax-seed is such a food, and its mucilaginous character when cooked specially adapts it to the tender mucous coat of the alimentary tract of the young animal. If flax-seed be difficult to obtain, linseed-meal, oatmeal, pease-meal or cotton-seed meal may be used. If whey be used as the basis of a ration, it should be fed sweet. Owing to its watery character, more grain should be fed with it than with skim-milk. Whatever meal is fed in milk or whey should be cooked.

I think it best to let the calf get its fill two or three times from the dam in nature's own way. Then feed it twice a day on whole milk, warm from the cow, until it is a week old. A gallon at a feed will be as much as an ordinary calf can assimilate. To teach a calf to drink, back it into a corner, get astride of its neck, and set the pail containing the milk down in front of it; place the first two fingers of the right hand in its mouth, keeping the palm of the hand over its nose. As soon as the calf commences to suck, lower its nose into the pail of milk; the calf will continue to suck, drawing the milk through the canal formed by the fingers; gently remove the fingers, keeping the calf's nose—not its nostrils—below the surface. If it keeps on drinking, the victory is won; but if objecting to this—to it unnatural

treatment—it ducks its head to the bottom of the pail and jerks it up again, spouting the milk all over you, don't swear and maul the innocent little stranger with a milking stool. Two or three lessons will usually be successful in teaching the most obstinate calf to drink. It becomes more difficult to teach calves to drink as they get older, but it can be done by persistence, patience and gentleness. After the first week, one-half of the new milk may be replaced by sweet skim-milk, with the addition of half a teacupful of flax-seed jelly. Instead of flax-seed, oil-cake, oil-meal, oat-meal, middlings or pease-meal may be fed—the last named sparingly, as it is constipating in tendency. The flax-seed may be gradually increased to half a pound a day for a calf of three months. Keep some clean, bright hay and chopped grain where the calf can reach it, and it will soon learn to eat. Don't be afraid that it will eat too much of these things.

In feeding calves there is a danger that the milk will be swallowed too rapidly, and thus produce indigestion and scouring. For young calves a nipple is often used, which obviates that difficulty. Half a teaspoonful of rennet-extract in the milk will correct the tendency to scours, and will prove an excellent promoter of digestion. If scouring be noticed, don't dose the calf with powerful astringents, but decrease the ration of milk, and to it add a teacupful of boiled flour.

Where two or more calves are fed together, keep them tied up while feeding, and for a short time afterwards, so that they cannot suck each other.

Feed regularly twice or three times a day, and have the milk at blood heat. Never feed cold milk to a young calf. It is better that the same person should attend the calves regularly.

Calves should be allowed access to pure water and salt. Don't miss the effects of good feeding, by allowing them to suffer for these prime necessaries.

After the calf is four months old, if milk be scarce, gradually lessen the quantity fed, until at the age of six or seven months it may be dispensed with entirely.

Exercise is beneficial, especially to calves intended for the dairy. The run of a grass plot should be given where convenient. The calf pen should be kept dry and clean.

Study the nature of the animal; respect its preferences; anticipate its wants; treat it kindly; be a watchful, intelligent feeder; and verily thou shalt not fail to raise good calves.

PART II.—SWINE.

Of thoroughbred swine there were purchased during the year:

Berkshire.

One boar, from Mr. Thomas Teasdale, Concord, Ont.

Tamworths.

One boar and one sow, from Messrs. J. L. Grant & Co., Ingersoll, Ont.

Poland Chinas.

Two sows (pure bred, but not now eligible for registration), from Messrs. W. M. & J. C. Smith, Fairfield Plains, Ont.

A number of grade pigs were purchased, with which to carry on experiments, of which some are still in progress.

Provision has been made for crossing some of the longer and leaner breeds, such as the Improved Large Yorkshires and Tamworths, on the shorter and more hardy breeds, such as the Essex, Berkshire, &c. The ultimate object will be to discover what cross or pure-bred swine will give the largest yield in weight, and the best quality of meat for every pound of feed consumed. A few feeding tests for a comparison of the cross-bred pigs are in progress at this writing.

Experiments in the Fattening of Swine.

In November, 1890, 24 grade pigs were purchased. Eight of them were white, and apparently grades of Chester whites; 16 of them were nearly all black, and were evidently grades of Berkshires. They were divided into six lots of four pigs in each.

The eight white pigs were put into pens Nos. 1 and 2, and the two lots of four each were, as nearly as possible, alike in weight and appearance. Both lots were fed on a mixture of grain, consisting of equal parts of ground pease, barley and rye. The object of this experiment was two-fold—(1) to discover the difference, if any, in the quantity of grain required to produce every pound of increase in the live weight of the swine, when *fed steamed and warmed* in the one case, and when *fed raw and cold* in the other case; (2) to obtain a record of the comparative quantities of grain required to produce every pound of increase in the live weight of the swine, during the different stages of the feeding period.

The mixture of grain was fed wet in both cases. Cold water was given to drink. A mixture of salt and wood ashes was kept in a box on the floor of each pen, where the pigs had access to it at will. The feed was weighed every day, and the swine once every week. In the following Table the feeding period has been arranged into five periods of four weeks each, and one period of three weeks. It shows the gain in weight and the quantities of grain consumed.

Table I.

——	9th December.	5th January.	2nd February.	2nd March.	30th March.	27th April.	18th May.	Totals.
Pen 1—Four Swine—	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.
Fed on a mixture of ground pease, barley and rye, *fed steamed and warmed:*								
Live weight	302	407	614	808	917	974½	745*	.. ..*Three swine only.
Gain in weight	....	105	207	194	109	57½	30	702½ gain in weight.
Feed consumed	....	348	637	736	545	406	256	2,928 grain consumed.
Feed consumed per lb. gain in live weight	....	....	....	....	....	....	.. ..	4·16 grain.
Pen 2—Four Swine—								
Fed on a mixture of ground pease, barley and rye, *fed raw and cold:*								
Live weight	308	413½	597	723	781½	830½	872	....
Gain in weight	....	105½	183½	126	58½	49	41½	564 gain in weight.
Feed consumed	....	348	563	558	413½	278½	237	2,398 grain consumed.
Feed consumed per lb. gain in live weight	....	....	....	....	....	....	.....	4·25 grain.
Pens 1 and 2—								
Average feed consumed per lb. of gain in live weight	....	3·31	3·07	4·04	5·73	6·45	6·93	
Percentage of increase in feed consumed per lb. of gain in live weight	....	....	....	31%	86%	110%	125%	

(1). Results :—Taking in the whole period, extending from 9th December to 18th May, 4·16 pounds of the mixture of grain, ground pease, barley and rye, were consumed for every pound of increase in the live weight, when fed steamed and warm, against 4·25 pounds of the grain when fed raw and cold.

(2). The swine, on the steamed and warm feed, gained 702½ pounds in live weight, against 564 pounds of gain by the swine on the raw and cold feed; but the former consumed 2,928 pounds of grain, as against 2,398 pounds of grain consumed by the latter. That indicates that when feed was provided, steamed and warm, the swine consumed larger quantities of it than when fed raw and cold; they also gained faster in weight, but every pound of increase in weight cost practically as much in grain in the one case as in the other. There was nothing to compensate for the labour and expense of the steaming.

(3). There was a marked and gradual increase in the quantity of grain consumed per pound of gain in live weight, after the second month of the feeding. That will be presented again in another Table.

Eight of the black pigs were put into Pens Nos. 3 and 4. The pigs in Pen 3 were as nearly as possible similar in weight and appearance to those in Pen 4.

In this experiment, the object was to discover the value, if any, of clover ensilage for the feeding and fattening of swine of an average weight of 64 pounds each.

Records were also kept, to ascertain the comparative quantities of feed required to produce every pound of increase in the live weight of the swine, during the different stages of the feeding period.

The pease ensilage was prepared by harvesting the crop when the earliest pods were filled and before the pease became hard. The vines were green and succulent. The ensilage was well preserved. The pigs in Pen 3 were fed an allowance of grain, a mixture of equal parts of ground pease, barley and rye, but not as much as they would have eaten readily. They were fed also a quantity of pease ensilage. The pigs in Pen 4 were fed upon pease ensilage only. In both cases the pigs refused to eat more than a small portion of whatever quantity of pease ensilage was offered to them. The remainder was nosed over, pushed about and tramped on. When what was left uneaten was weighed out of the pens it was very wet.

Both lots of pigs were allowed cold water to drink, and a mixture of salt and ashes was accessible to the pigs in both pens. The pease ensilage did not seem to have any feeding value to the pigs which received an allowance of grain; and the pigs in Pen 4 steadily decreased in weight for nine weeks, when the feeding of ensilage was ended.

The following Table contains the details of the weights of pigs, feed consumed, and rate of gain in live weight:—

TABLE II.

——.	29th December.	5th January.	2nd February.	2nd March.	30th March.	27th April.	18th May.	Totals.
Pen 3—Four Swine—								
Fed on a mixture of ground pease, barley and rye, *fed steamed and warmed*, and pease ensilage—	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.
Live weight	254	267	414	*379	442	494	548	*Three swine only.
Gain in weight	....	13	147	74	63	52	54	403 gain in weight.
Feed consumed { Grain	....	63	474	335	287	260	243	1,662 grain consumed.
Feed consumed { Pease ensilage	....	112½	682	345				
Pease ensilage left uneaten (wet)	....	100	625	319				
Grain consumed per lb. of gain in live weight	....	....	....	....	....	....	....	4·12 grain.
Pen 4—Four Swine—								
Fed on pease ensilage only until 2nd March—								
Live weight	256	237	223	205				
Loss in weight	....	19	14	18	....	....	....	51 loss in weight.
Pease ensilage fed	....	235	1401	2127				
do left uneaten (wet)	....	150	938	1409				
After 2nd March, fed on a mixture of ground pease, barley and rye, *fed raw and cold*—								
Live weight	....	....	....	205	395½	512½	571	
Gain in weight	....	....	....	....	190½	117	58½	366 gain in weight.
Feed consumed	....	....	....	....	443	388	327	1,158 grain consumed.
do per lb. of gain in live weight	....	....	....	....	2·32	3·31	5·59	3·16 grain.
Pens 3 and 4—								
Average feed consumed per lb. of gain in live weight	....	4·84	3·22	4·52	2·88	3·83	5·06	

THE OTHER EIGHT BLACK PIGS—Berkshire grades—were put into Pens Nos. 5 and 6, and the two lots were as nearly similar in appearance and weight as possible. The objects of this experiment were the same as those in the experiment with the swine in Pens 1 and 2. The method of conducting it was similar, with the difference of sugar beets being fed to the swine in both pens, with the grain mixture.

Table III shows the weights of the swine, the gains in weight, and the quantities of feed consumed.

TABLE III.

——	9th December.	5th January.	2nd February.	2nd March.	30th March.	27th April.	18th May.	Totals.
Pen 5—Four Swine—	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.
Fed on a mixture of ground pease, barley and rye, *fed steamed and warmed*, and sugar beets—								
Live weight.........	187	258	425	581	669	744½	812	
Gain in weight	...	71	167	156	88	75½	67½	625 gain in weight.
Feed consumed { Grain.	....	333	412	540	475	369	282	2,411 grain consumed.
Feed consumed { Sugar beets......	....	44½	330	313	320	308	224	1,538 sugar beets consumed.
Feed consumed per lb. of gain in live weight.	...	..	...	. .	....	....	...	{ 3·86 grain. 2·46 sugar beets.
Pen 6—Four Swine—								
Fed on a mixture of ground pease, barley and rye, *fed raw and cold*, and sugar beets—								
Live weight	201	272	415	547	692	731	772	
Gain in weight	....	71	143	132	145	39	41	571 gain in weight.
Feed consumed { Grain.............	....	225	396	503	458	371	270	2,223 grain consumed.
Feed consumed { Sugar beets	....	60	320	307	310	322	244	1,563 sugar beets consumed.
Feed consumed per lb. of gain in live weight....	....	....	....	. ..	. ..	....	....	{ 3·89 grain. 2·73 sugar beets.
Pens 5 and 6—								
Average feed consumed per lb. of gain in live weight............... { Grain.... .	....	3·93	2·61	3·62	4·00	6·50	4·33	
Average feed consumed per lb. of gain in live weight............... { Sugar beets.	....	0·72	2·10	2·15	2·73	5·52	5·11	
*Percentage of increase in feed consumed per lb. of gain in live weight.	....	....		21 per ct.		90 per ct.		
*1 lb. grain equal to 5 lb. sugar beets..	....	....		....		....		

The following Table shows the quantities of feed consumed per pound of gain in live weight, during each of the six feeding periods. The duration of each feeding period was four weeks, with the exception of the first period for Pens 4 and 5, and the last period for all the Pens, which was three weeks. The grain fed in each case was a mixture of equal parts of ground pease, barley and rye. No notice is taken in this Table of the pease ensilage fed to Pens 4 and 5, as it did not appear to have any appreciable feeding value in these cases.

TABLE IV.—Pounds of Feed consumed per pound of gain in the live weight of swine.

—	Pen 1, 4 Swine; Grain, Fed Steamed and Warm.	Pen 2, 4 Swine; Grain, Fed Raw and Cold.	Pen 3, 4 Swine; Grain, Fed Steamed and Warm.	Pen 4, 4 Swine; Grain, Fed Raw and Cold.	Pen 5, 4 Swine; Grain, Fed Steamed and Warm, and Sugar Beets.		Pen 6, 4 Swine; Grain, Fed Raw and Cold, and Sugar Beets.	
Feeding Periods.	Grain, Lb.	Grain, Lb.	Grain, Lb.	Grain. Lb.	Grain, Lb.	Sugar Beets, Lb.	Grain, Lb.	Sugar Beets, Lb.
First	3·31	3·30	4·84	....	4·69	0·61	3·17	0·84
Second.........	3·07	3·07	3·22	....	2·46	2·00	2·76	2·23
Third	3·79	4·43	4·52	....	3·46	2·00	3·81	2·32
Fourth..........	5·00	7·07	4·55	2·32	5·40	3·63	3·15	2·13
Fifth.......	7·06	5·68	5·00	3·31	4·88	4·08	9·51	8·25
Sixth...........	8·53	5·71	4·50	5·59	4·17	3·31	6·58	6·00
Average	4·16	4·25	4·12	3·16	3·86	2·46	3·89	2·73

CONCLUSIONS.—The teaching of these three sets of experiments is to the effect that :—

(1.) There is no appreciable difference in the number of pounds of grain required to produce every pound of increase in the live weight of swine, when fed steamed and warm, as against fed raw and cold;

(2.) On the average there is a gradual increase in the quantity of feed consumed, for every pound of gain in live weight of swine, after the second month of their feeding period and after the average live weight exceeds 100 lb. ;

(3.) It is economical to market swine for slaughtering when they weigh from 180 to 200 lb. alive;

(4.) The *largest* consumption of feed per day by swine is at or near the period of their feeding, when the number of pounds of feed consumed, per pound of increase in weight, is *lowest ;*

(5.) For the increase of weight by 3,231½ lb. in 24 swine, 4·14 lb. of a mixture of ground pease, barley and rye were required for every pound of increase in live weight.

Several series of feeding tests are in progress, mainly for the purpose of determining the relative values of (1) ground grain and whole grain; (2) of grain and skim milk; and (3) of frozen wheat from Manitoba and North-West Territories. At this writing, the quantity of ground frozen wheat consumed per pound of increase in live weight has been 5·30 lb., with swine weighing from 185 lb. to 275 lb. live weight each, and 3·93 lb. of ground frozen wheat per pound of increase in live weight with swine weighing from 70 lb. to 105 lb. each.

PART III.—EXPERIMENTAL DAIRY WORK.

The experimental dairy building on the farm, which was described in the annual report for 1890, was completed early in 1891. A cut of it appears underneath.

The machinery and apparatus are adequate for the present needs of the farm, and enable us to carry on investigations which are considered to be capable of rendering the most immediate and practicable service to the dairymen of the country.

An 8 h. p. boiler and 6 h. p. steam engine were purchased from Mr. Geo. Low, of Ottawa, who also fitted up the steam pipes and shafting throughout the building.

A hand-power centrifugal cream separator, manufactured by Burmeinster & Wain, of Copenhagen;

A No. 4 "Alexandra" centrifugal cream separator, and a No. 8 "Alexandra" centrifugal cream separator for operation by hand-power, manufactured by R. A. Lister & Co., Dursley, England;

One No. 5 Daisy revolving barrel churn of fourteen gallons' capacity, and two No. 2 Daisy churns of four gallons capacity each;

A Boyd cream ripening vat, and fermentation starter vat;

A lever butter worker for hand use;

Several Babcock milk-testers;

Two pairs of weighing scales; and the usual outfit of small dairy utensils, such as deep-setting milk pails, 20″ x 8½″ diam., shallow milk pans, strainer, skimmer, butter printer, thermometers, water pails, hot water and cold water tanks, washing sink, brushes, etc., furnish the dairy with conveniences for carrying on its work.

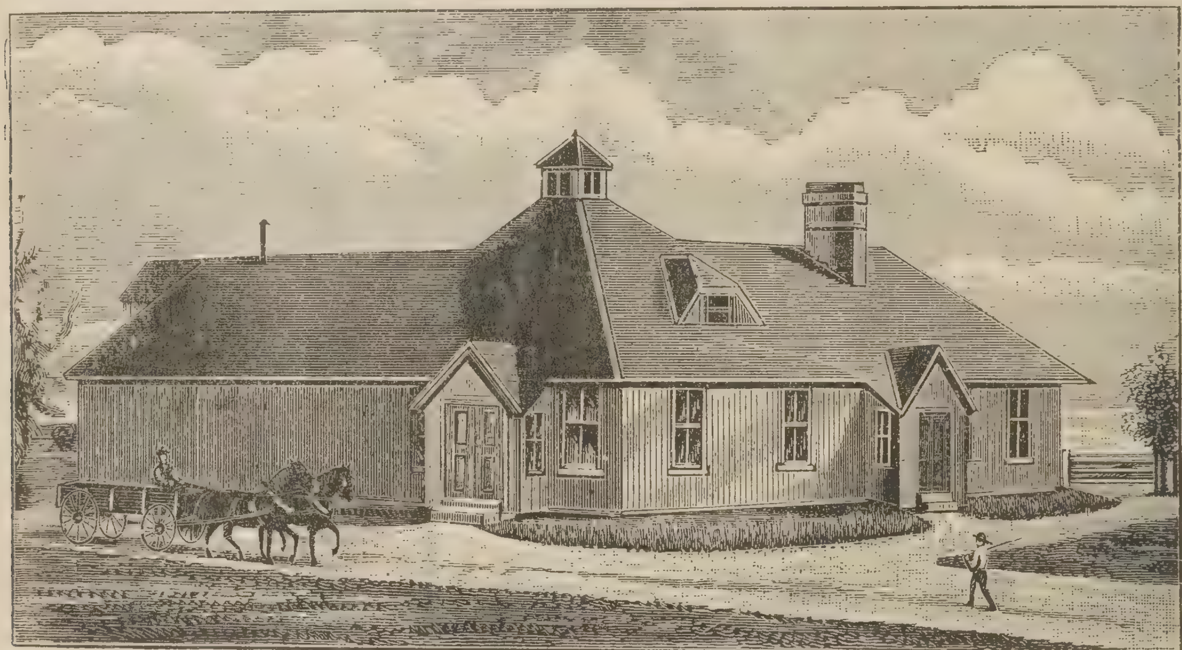

Fig. IV.—Dairy Building, Central Experimental Farm.

Besides these, there are several tables, and a milk-setting tank which merits particular description for the information of farmers. The tank is constructed of 2-inch pine lumber; its length is 7 ft. 6 in.; its width 2 feet, and its depth 2 feet. These are inside measurements. It is divided into four compartments, each 21 x 24 x 24 inches. That size gives sufficient space for the setting of four deep-setting milk pails in each. Cold water is led into each compartment by means of a pipe which runs down to within 1 inch from the bottom. The overflow of water—when it has been slightly warmed by contact with the milk-pails—is carried off by a pipe at its surface. Where the supply of cold water is limited, this method of leading the cold water to *near the bottom of the tank*, and conducting the water which has been warmed from the surface to the overflow pipe or drain, will enable the cooling power of the water to be used most economically. The overflow water may be in excellent condition for the watering of stock, where and when water for both purposes is scarce.

PARTICULARS OF EXPERIMENTS.

In the course of the experimental work of the year a great mass of valuable data has been accumulated in the records. As far as experiments have been completed, or even advanced sufficiently to furnish useful guidance for dairymen in their practice, they will be reported upon. The tests for comparison between the centrifugal cream separators and the setting methods are not ready to be reported on in full, as it is considered desirable to make a record of the results which are found during every month of the year before any definite conclusion is announced.

Instead of burdening the pages of the report with the details of single tests only, a statement of the average results of from 4 to 12 tests will be presented in most of the different experiments. Our herd of milking cows contains animals of seven different breeds, beside grade milch cows. When not otherwise specified, the milk used in the experiment was mixed herd milk.

Experiments in Deep-setting of Milk at different Temperatures.

The test was conducted for six days—28th May to 4th June—and included six settings of morning milk and six settings of evening milk in each case. The whole quantity of milk used was herd milk, and was thoroughly mixed in a large vessel before it was divided into three lots. The setting period was 22 hours. Table I shows the average results from the 12 tests:—

TABLE I.

Temperature of Milk when set.	98° Fahr.	88° Fahr.	78° Fahr.
Quantity of milk set.. Lb.	35	35	35
Per cent of butter-fat in milk..	3·48	3·48	3·48
Temperature of water.. Fahr.	49°	49°	49°
Quantity of skim-milk.. Lb.	29·6	29·8	30·25
Per cent of butter-fat in skim-milk..	0·62	0·64	0·71
Quantity of fat in whole milk.. Lb.	1·22	1·22	1·22
do left in skim-milk.. "	0.183	0·190	0·214
Percentage unrecovered..	15 04	15·63	17·60

This experiment shows that the loss of butter-fat—unrecovered from the skim-milk—was only ·59 of 1 per cent greater, when milk was set 88° Fahr., than when it was set 98° Fahr.; and that the loss of unrecovered butter-fat was 2·53 per cent greater when milk was set at 78° Fahr. than when it was set at 98° Fahr.

Experiment in Immediate vs. Delayed Setting of Milk.

This test was conducted for six days—from 27th July to 2nd August—and included six settings of morning milk and six settings of evening milk in each case. The milk was herd milk, and was mixed immediately after milking, before it was divided into two lots. One lot was set at once in a deep-setting pail, in ice water, of a temperature of 38° Fahr.; another lot was left in a pail in the dairy room for one hour, and was then set in ice water, under conditions precisely similar. The following Table shows the average results from the morning and evening tests:—

TABLE II.

	Morning Milk.		Evening Milk.	
	Immediate setting.	Delayed one hour.	Immediate setting.	Delayed one hour.
Quantity of milk set .... Lb.	35	35	35	35
Per cent of butter-fat in milk..........	3·53	3·53	3.93	3·93
Temperature when set ....Fahr.	98°	88°	98°	88°
Per cent of butter-fat in skim-milk..........	·48	·96	·65	1·20
Highest per cent of butter-fat in skim-milk..........	·9	1·2	·9	1·8
Lowest do do do	·4	·75	·4	·7
Setting period in hours..........	22	21	22	21
Quantity of fat in whole milk.......... Lb.	1·23	1·23	1·37	1·37
do left in skim-milk.......... "	0·139	0·278	0·188	0·348
Percentage unrecovered..........	11·31	22·63	13·76	25·40

This experiment shows that the loss of unrecovered butter-fat—which was left in the skim-milk—was 11·48 per cent greater, when the setting of milk in deep-setting pails in ice water was delayed one hour, than it was when the milk was set immediately.

Experiment in Deep-setting of Milk for 11 *Hours vs.* 22 *Hours.*

This test was continued for six days—from 12th August to 18th August—and comprised six settings of morning milk and six settings of evening milk in each case. The milk was mixed herd milk, and was set immediately after it reached the dairy building in deep-setting pails, in ice water of a temperature of 38° to 40° Fahr.

Table III shows the average results from the 24 settings of milk.

TABLE III.

	Morning Milk.		Evening Milk.	
Setting Period...	11 Hours.	22 Hours.	11 Hours.	22 Hours.
Quantity of milk set.......... Lb.	35	35	35	35
Per cent of butter-fat in milk..........	3·61	3·61	4·27	4·27
Temperature when set ....Fahr.	96°	96°	95°	94°
Per cent of butter-fat in skim-milk..........	·98	·55	·97	·65
Highest per cent of butter-fat in skim-milk..........	1·4	·8	1·6	·8
Lowest do do do	·7	·3	·8	·4
Quantity of fat in whole milk.......... Lb.	1·26	1·26	1·49	1·49
do left in skim-milk.......... "	0·284	0·159	0·281	0·188
Percentage unrecovered..........	22·55	12·65	18·87	12·65

This experiment shows that the loss of unrecovered butter-fat was 9·9 per cent greater for the morning milk, and 6·22 per cent greater for the evening milk, when the milk was set in deep pails for 11 hours, than it was when the milk was set for 22 hours.

Experiment on the effect of adding Water to Milk in Deep-setting.

The test was carried on for six days—from 24th September to 1st October—and included six settings of morning milk and six settings of evening milk, or 36 settings in all. The milk used was herd milk, and was mixed in one vessel, before any difference of treatment was given. To one lot, 25 per cent of water at a temperature of 160° Fahr. was added; to another lot, 25 per cent of water at a temperature of 60° Fahr. was added; and the third lot was set under similar conditions with the others, and without the addition of any water.

The following Table shows the average results from 12 settings in each case; the setting period was 22 hours:—

TABLE IV.

——	25 per cent of Water at 160° Fahr. added.	25 per cent of Water at 60° Fahr. added.	No Water added.
Quantity of milk set........ Lb.	25	25	35
Percentage of butter-fat in milk........	3·52	3·52	3·52
Temperature of milk when mixed........ Fahr.	92°	92°	92°
do milk when set........	110°	82°	92°
do water in tank........	38°	38°	38°
Percentage of fat left in skim-milk........	·63	·60	0 58
Quantity of fat in whole milk........ Lb.	0·88	0·88	1·23
do left in skim-milk........ "	0·130	0·124	0·168
Percentage unrecovered........	14·82	14·11	13·67

This experiment shows that there was practically no appreciable difference (1·15 per cent) between the percentages of unrecovered fat left in the skim-milk, when 25 per cent of water at 160° Fahr., 25 per cent of water at 60° Fahr., and no water added, were the differences of treatment in the setting of milk, in deep-setting pails in ice water.

Four Experiments in the Creaming of Milk from Cows at different stages of Lactation, by the Deep-setting method.

For these tests, which were conducted in November, the cows of the herd were divided into three groups, according to the length of time during which they had been milking since the last calving.

Group I contained the cows which had been milking for periods ranging from 8 to 11 months, and was made up of 1 Shorthorn, 1 Shorthorn grade, 2 Jerseys, 1 Holstein, 1 Devon and 1 Quebec Jersey.

Group II contained the cows which had been milking for periods ranging from 5 to 7 months, and was made up of 6 Quebec Jerseys, 2 Shorthorn grades and 1 Devon.

Group III contained the cows which had been milking for periods ranging from 1 to 3 months, and was made up of 3 Ayrshires, 3 Holsteins, 2 Shorthorns, 1 Shorthorn grade and 1 Polled Angus.

The setting period in all cases was 22 hours.

THE FIRST EXPERIMENT was conducted for five days. The milk was set in cold water, in which no ice was used, of a temperature of 47° Fahr.

Table V shows the average results from five tests of the setting of morning milk and five tests of the setting from evening milk of each group, or 30 settings in all :—

TABLE V.

—	GROUP I.		GROUP II.		GROUP III.	
	Morning Milk.	Evening Milk.	Morning Milk.	Evening Milk.	Morning Milk.	Evening Milk.
Quantity of milk set. ....Lb.	33	31	34	30	35	35
Per cent of butter-fat in whole milk....	3·86	4·26	3·80	4·17	2·86	3·6
Temperature when set ....Fahr.	87°	88°	89°	87°	91°	91°
Per cent of butter-fat left in skim-milk..	1·14	1·55	1·84	1·5	·65	1·13
Quantity of fat in whole milk.......Lb.	1·27	1·32	1·29	1·25	1·00	1·26
do left in skim-milk.... "	0·311	0·398	0·518	0·372	0.188	0·327
Percentage unrecovered............	24·54	30·15	40·18	29·82	18·85	26·00

THE SECOND EXPERIMENT in this series was continued for four days. The milk was set immediately after it reached the dairy building from the stables, in ice water, which was maintained at a temperature of 38° Fahr.

Table VI shows the results from the four settings of morning milk and the four settings of evening milk, from each group, or 24 settings in all :—

TABLE VI.

—	GROUP I.		GROUP II.		GROUP III.	
	Morning Milk.	Evening Milk.	Morning Milk.	Evening Milk.	Morning Milk.	Evening Milk.
Quantity of milk set..............Lb.	35	27	35	31	35	34
Per cent of butter-fat in whole milk....	3·95	4·42	3·9	4·17	2·8	3·15
Temperature when set ....Fahr.	89°	92°	92°	94°	93°	95°
Per cent of fat left in skim-milk.......	1·2	1·7	1·05	1·05	·45	·55
Quantity of fat in whole milk ......Lb.	1·38	1·19	1·36	1·29	0·98	1·07
do left in skim-milk.. "	0·348	0·380	0·304	0·269	0·130	0·154
Percentage unrecovered.....	25·22	31·95	22·39	20·85	13·26	14·48

THE THIRD EXPERIMENT in the series lasted for four days. The milk was re-heated to 98° Fahr. after it reached the dairy building, and was set immediately thereafter in ice water, which was maintained at a temperature of 38° Fahr.

Table VII shows the results from the four settings of morning milk and the four settings of evening milk, from each group, or 24 settings in all :—

TABLE VII.

—	Group I.		Group II.		Group III.	
	Morning Milk.	Evening Milk.	Morning Milk.	Evening Milk.	Morning Milk.	Evening Milk.
Quantity of milk set .... Lb.	32	26	34	31	35	34
Per cent of butter-fat in whole milk...	3·71	3·9	3·8	4·2	3·1	3·6
Temperature when set.......... Fahr.	98°	98°	98°	98°	98°	98°
Per cent of fat left in skim-milk.......	1·5	1·65	1·15	1·02	·45	·52
Quantity of fat in whole milk..... Lb.	1·19	1·01	1·29	1·30	1·08	1·22
do in skim-milk...... "	0·397	0·356	0·324	0·308	0·130	0·146
Percentage unrecovered..............	33·40	35·19	25·11	23·70	12·08	12·00

THE FOURTH EXPERIMENT in the series extended over five days. To the milk from Groups I and II, 10 per cent of water was added before it was set; the milk from Group III was delayed in setting for half an hour, then reheated to 98° Fahr., and set immediately afterwards, without the addition of water.

Table VIII shows the results from the five settings of morning milk and the five settings of evening milk from each group, or 30 settings in all :—

TABLE VIII.

—	Group I.		Group II.		Group III.	
	Morning Milk.	Evening Milk.	Morning Milk.	Evening Milk.	Morning Milk.	Evening Milk.
Quantity of milk set.............. Lb.	33	25	34	31	35	35
Per cent of butter-fat in whole milk...	3·70	3·96	3·52	3·8	3·	3·24
do water added..............	10	10	10	10	0	0
Temperature when set..........Fahr.	98°	98°	98°	98°	98°	98°
Per cent of fat in skim-milk...........	1·75	1·40	1·25	1·26	·54	·62
Quantity of fat in whole milk ...... Lb.	1·22	0·99	1·20	1·18	1·05	1·13
do skim-milk........ "	0·478	0·290	0·352	0·324	0·156	0·180
Percentage unrecovered...............	39·22	29·29	29·34	27·43	14·91	15·91

The next Table has been arranged to show the relative efficiency of the creaming which resulted from the different treatments of the milk, in each of the four experiments of the series. The comparison between the different treatments requires this explanation: The different treatments were given to the milk of the same cows upon four consecutive weeks. That did not afford a basis, for a comparison of the effects of different setting conditions on milk, as sufficient or as reliable as when different portions of herd milk, from the same cows on the same day, are subjected to different setting conditions for creaming. This experiment provided for treating the milk from the different groups alike on the same days, as the comparison was between the milks of the different groups, and not between the different methods of setting.

Table IX shows the percentage of unrecovered fat, which was left in the skim milk in the case of each of the three groups of cows, during each of the four experiments:—

TABLE IX.

——	Group I.	Group II.	Group III.
FIRST EXPERIMENT.—Milk set in water of a temperature of 47° Fahr	27·34	35·00	22·42
SECOND EXPERIMENT.—Milk set in ice water of a temperature of 38° Fahr	28·58	21·62	13·87
THIRD EXPERIMENT.—Milk re-heated to 98° and set in ice water of a temperature of 38° Fahr	34·29	24·40	12·04
FOURTH EXPERIMENT.—10 per cent of water added to milk of Groups I and II; milk of Group III delayed half an hour, then re-heated to 98° Fahr	34·25	28·38	15·41
Average of four experiments	31·11	27·35	15·93

These four experiments in the setting of milk in deep-setting pails, with 36 setting tests for the milk of each of three groups of cows, show:—

(1.) That 31·11 per cent of the butter-fat was not recovered from the skim-milk, in the case of the group of cows which had been milking for periods of from 8 to 11 months each.

(2.) That 27·35 per cent of the butter-fat was not recovered from the skim-milk, in the case of the group of cows which had been milking for periods of from 5 to 7 months each.

(3.) That 15·93 per cent of the butter-fat was not recovered from the skim-milk, in the case of the group of cows which had been milking for periods of from 1 to 3 months each.

Experiment in Deep-setting, as compared with Shallow-pan Setting, with the Milk from Cows of Groups I and II.

The cows which composed Groups I and II were the same as those described for the series of experiments which have been recorded in Tables V to IX. A portion in each case was set in an ordinary shot-gun, deep-setting pail, of 8½ inches diameter, set in water without ice, of a temperature of 45° Fahr.; another portion of the mixed milk was set in shallow-pans to a depth of 2½ inches.

The milk was set in each case for a period of 22 hours.

The test was continued for five days—8th to 12th December, 1891.

The following Table shows the results:—

TABLE X.

Method of Setting...	GROUP I (Milking 9 to 12 months).				GROUP II (Milking 6 to 8 months).			
	Deep-setting.		Shallow-pan.		Deep-setting.		Shallow-pan.	
	Morning Milk.	Evening Milk.	Morning Milk.	Evening Milk.	Morning Milk.	Evening Milk.	Morning Milk.	Evening Milk.
Quantity of milk set......... Lb.	19	....	8	8	24	24	8	8
Per cent of butter-fat in milk . . .	4·1	....	4·1	4·8	4·1	4·6	4·1	4·6
Temperature of milk when skimmed.. ....Fahr.	45°	....	55°	55°	45°	45°	55°	55°
Quantity of cream obtained...Lb.	3·5	....	1·5	1·5	4·	4·	1·5	1·5
do of skim-milk...... "	15·5	....	6·5	6·5	20	20	6·5	6·5
Per cent of fat left in skim-milk..	2·1	....	·27	·21	2·3	2·6	·25	·35
Quantity of fat in whole milk.. Lb.	·779	....	·328	·384	·984	1·104	·328	·368
do of fat left in skim-milk .. .. "	.325	....	·017	·014	·460	·520	·016	·022
Percentage unrecovered..	41·72	....	5·18	3·65	46·75	47 10	4·88	5·98

This experiment shows that the loss of unrecovered butter-fat left in the skim-milk, from the milk of cows at the milking periods of from 6 to 12 months since calving, was 40·27 per cent greater when the milk was set in deep-setting pails, in water at a temperature of 45° Fahr., than when it was set in shallow-pans to a depth of 2½ inches.

During the winter season, as well as during the summer, it seems necessary, in order to obtain efficient creaming by means of deep-setting pails, to use ice-water of a temperature at or below 40° Fahr. That appears to be particularly essential in the setting of milk from cows which have been milking for periods of more than 6 months. To prevent any one from inferring a misleading conclusion from Table X, the following Table has been prepared to show the results from the testing of the mixed milk from the whole herd, for a period of three months. The trials of the different methods of separating the cream, of which the average results appear in Table XI, lasted for one week in every month in each case. The full report of this experiment, which is not yet completed, will appear in the next annual report.

TABLE XI.

	Centrifugal Cream Separator.	Deep-setting in Ice-water at 38°.	Shallow-pan setting to depth of 2½ in.
Per cent of butter-fat in whole milk..........	3·82	3·81	3·82
Quantity of milk per lb. of butter.......... . ... Lb.	23·71	25·97	24·91
do butter obtained per lb. of butter-fat in whole milk "	1·104	1·005	1·051

The results of these experiments, and of the series of experiments recorded from Tables V to X, seem to indicate:—

(1.) That by the deep-setting of milk from cows which have been milking for periods of 5 to 12 months in cold water of a temperature of 45° or 48° Fahr., without the use of ice, about 37 per cent of the butter-fat was left in the skim-milk; and by setting in ice water of a temperature of 38° Fahr. about 28 per cent of the butter-fat was left in the skim-milk.

(2.) That during the fall and winter, particularly, the use of shallow-pans for the setting of milk from cows, which have been milking for periods of from 5 to 12 months, will permit the recovery in the cream of about 95 per cent of the butter-fat in the whole milk.

(3.) That the use of the centrifugal cream separator will enable the dairyman to recover practically the whole of the butter-fat into the cream, from the milk of cows at all stages of lactation, and during all seasons of the year.

Experiment in the Setting of Milk in a Cheese-factory Milk-can, 15 *inches in diameter, and in a Shot-gun Can,* 8½ *inches in diameter.*

Among the patrons of cheese factories, the practice of using the cheese-factory milk-cans for the setting of milk for cream, after the close of the cheese-factory season, is a common one. A comparison between setting milk in a milk-can 15 inches in diameter and an ordinary shot-gun can 8½ inches in diameter, was made by setting morning milk for three days, and evening milk for three days, between 9th and 14th November. A quantity of herd milk was mixed before it was divided into two portions. It was put into the two cans, to an equal depth—about 19 inches. Both lots were set in ice-water, at 38° Fahr., for 22 hours.

The following Table shows the result:—

TABLE XII.

	Milk-can, 15 inches diameter.		Shot-gun Pail, 8½ inches diameter.	
	Morning Milk.	Evening Milk.	Morning Milk.	Evening Milk.
Quantity of milk in three settings.................... Lb.	315	315	105	105
Per cent of butter-fat in milk............................	3·36	3·46	3·36	3·46
do fat left in skim-milk..........................	·71	·73	·45	·47
Quantity of fat in whole milk........................ Lb.	10·58	10·90	3·53	3·63
do left in skim-milk .... "	1.83	1·88	·39	·40
Percentage unrecovered..............................	17·32	17.27	11·05	11·13

This experiment shows that the loss of unrecovered fat—left in the skim-milk—was 6·2 per cent greater, by the use of a milk-can 15 inches in diameter, than by the use of a deep-setting pail 8½ inches in diameter.

Experiments in the Churning of Cream.

The first series of experiments was undertaken to discover what difference, if any, in the product of butter, resulted from the churning of cream obtained by the deep-setting method, from the milk of three groups of cows at different stages of

lactation. The cows which composed the three groups were the same as those described in Tables V to IX, viz. :—

Group I contained cows which had been milking for periods ranging from 8 to 11 months.

Group II contained cows which had been milking for periods ranging from 5 to 7 months.

Group III contained cows which had been milking for periods ranging from 1 to 3 months.

THE FIRST TRIAL was made on 28th November. A portion of the milk of two days was used from the cows of each group.

The milk was set immediately after it reached the dairy building, at a temperature of 96° Fahr., in deep-setting pails, in ice-water of a temperature of 38° Fahr.

The setting period was 22 hours.

In each case 5 per cent of fermentation starter was added, and the cream of the three lots was ripened to as nearly the same stage of acidity as possible.

The ripening period in this trial was 12 hours.

Table XIII shows the result of the first trial of churning cream from the milk from each of the three groups.

TABLE XIII.

—	Milk from		
	Group I.	Group II.	Group III.
Quantity of milk set.......... Lb.	121	138	248
Per cent of butter-fat in milk..........	4·3	4·1	3·1
Creaming—			
Quantity of cream.......... Lb.	26	27	38
Per cent of fat left in skim-milk..........	1·20	1·00	·65
Churning—			
Churning temperature..........Fahr.	64°	64°	62°
Minutes churned..........	150	100	40
Revolutions of churn per minute..........	65	65	66
Quantity of butter obtained.......... Lb.	4·75	5·75	8·00
do buttermilk.......... "	21	21	30
Per cent of fat left in buttermilk..........	·20	·30	·20
Results—			
Quantity of fat in whole milk.......... Lb.	5·20	5·66	7·69
do do left in skim-milk and buttermilk.......... "	1·18	1·17	1·42
do of milk per lb. of butter.......... "	25·5	24·	31·
Percentage of fat unrecovered..........	22·69	20·67	18·46

The Second Trial was made on 30th November. A portion of the milk of two days was used from the cows of each group. The milk was re-heated to a temperature of 98° after it reached the dairy building, and was set immediately thereafter in deep-setting pails, in ice-water of a temperature of 38° Fahr.

The setting period was 22 hours.

In each case 5 per cent of fermentation starter was added, and the cream of the three lots was ripened to as nearly the same stage of acidity as possible.

The ripening period in this trial was 15 hours.

Table XIV shows the result of the second trial of churning cream from the milk from each of the three groups.

Table XIV.

—	Milk from		
	Group I.	Group II.	Group III.
Quantity of milk set .... Lb.	114	137	279
Per cent of butter-fat in milk........................	4	4·1	3·1
Creaming—			
Quantity of cream........................ Lb.	22	27	51
Per cent of fat left in skim-milk	1·35	1·00	0·55
Churning—			
Churning temperature........................ Fahr.	64°	64°	62°
Minutes churned........................	180	100	50
Revolutions of churn per minute	60	65	66
Quantity of butter obtained........................ Lb.	4·12	5·25	9·75
do buttermilk........................ "	17	21	41
Per cent of fat left in buttermilk........................	·45	·35	·30
Results—			
Quantity of fat in whole milk........................ Lb.	4·56	5·62	8·65
do left in skim-milk and buttermilk........ "	1·31	1·17	1·37
Quantity of milk per pound of butter .... "	27·6	26·1	28·6
Percentage of fat unrecovered........................	28·73	20·82	15·84

The Third Trial was made on 4th December. A portion of the milk of two days was used from the cows of each group. The milk was re-heated to a temperature of 95° after it reached the dairy building. To the milk from Groups I and II, 10 per cent of water was added, before it was set; the milk from Group III was delayed in setting for half an hour; it was re-heated to 98° and set without the addition of water. The three lots were set in deep-setting pails, in ice-water of a temperature of 38° Fahr. The setting period was 22 hours. In each case 5 per cent of fermentation starter was added to the cream, and each lot was ripened to as nearly the same stage of acidity as possible. The ripening period in this trial was 16 hours.

Table XV shows the result of the third trial of churning the cream from the milk, from each of the three groups.

TABLE XV.

—	Milk from		
	Group I.	Group II.	Group III.
Quantity of milk set .... Lb.	116	121	308
Per cent of butter-fat in milk	3·6	3·8	3.8
Creaming—			
Quantity of cream .... Lb.	23	24	62
Per cent of fat left in skim-milk	1·60	1·30	·50
Churning—			
Churning temperature .... Fahr.	70°	64°	62°
Minutes churned	49	85	49
Revolutions of churn per minute	65	65	66
Quantity of butter obtained .... Lb.	3·25	4·75	12·00
Quantity of buttermilk .... "	19	19	50
Per cent of fat left in buttermilk	·35	·15	·20
Results—			
Quantity of fat in whole milk .... Lb.	4·18	4·60	11·70
Quantity of fat left in skim-milk and buttermilk .... "	1.55	1.28	1·33
Quantity of milk per lb. of butter .... "	31	25·5	25·6
Percentage of fat unrecovered	37·79	27·82	11·37

Table XVI shows the length of time required for churning, and the percentage of butter-fat left in the buttermilk, from the three trials in each case.

TABLE XVI.

	Group I.			Group II.			Group III.		
No. of Trial.....	First.	Second.	Third.	First.	Second.	Third.	First.	Second.	Third.
Churning temperature, Fahr...	64°	64°	70°	64°	64°	64°	62°	62°	62°
Minutes churned...	150	180	49	100	100	85	40	50	49
Revolutions of churn per minute	65	60	65	65	65	65	66	66	66
Percentage of fat left in buttermilk	·20	·45	·35	·30	·35	·15	·20	·30	·20

The conclusions which were indicated by these churning experiments were:—

(1) That the cream from the milk of cows, which have been milking for periods of from five to eleven months, should be churned at a temperature of from 66° to 70° Fahr., in order to obtain butter in from one hour to three-quarters of one hour.

(2) That the loss of fat unrecovered from the buttermilk, was practically the same, viz., ·33, ·26, ·23 of 1 per cent of fat, left in the buttermilk, from Groups I, II and III, respectively.

(3) An examination of the butter showed a decided absence of rosy and delicate flavour in the butter obtained from the milk of cows which had been milking for longer than five months.

The second series of experiments in the churning of cream was made to determine the effect on the quantity of butter which could be obtained by churning cream at different stages of ripeness or acidity.

THE FIRST TRIAL was conducted on the 29th August; 120 lb. of cream were taken from 676 lb. of milk. The whole quantity of cream was mixed thoroughly, and afterwards divided into two equal lots. One lot was ripened by the addition of fermentation starter, and by being kept at a temperature of 64°; the other lot was cooled to 40° and kept sweet until the following day. Both lots were then divided into equal portions of 30 lb. each; 30 lb. of the sour ripened cream was then mixed with 30 lb. of the sweet cream, leaving three lots for churning, as shown in the following:—

Lot 1, sour cream......... { 30 lb., sour, in churn No. 1.
{ 30 lb. } mixed, in churn No. 2.
Lot 2, sweet cream....... { 30 lb. }
{ 30 lb. sweet, in churn No. 3.

A SECOND TRIAL was made on the 10th September, when 120 lb. of cream were taken from 774 lb. of milk. The whole quantity of cream was treated in the manner which has been described in the first trial.

The following Table shows the results from the two trials of churning cream at different stages of ripeness.

TABLE XVII.

—	First Trial.			Second Trial.		
No. of churn	No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
Daisy churn ... Size.	No. 2	No. 5	No. 2	No. 2	No. 5	No. 2
Quantity of milk ... Lb.	169	338	169	194	387	194
do cream ... "	30	60	30	30	60	30
Stage of ripeness	Sour.	Mixed.	Sweet.	Sour.	Mixed.	Sweet.
Churning temperature ... Fahr.	59°	60°	60°	62°	62°	62°
Minutes churned	53	35	65	40	30	65
Revolutions of churn per minute	66	62	68	66	64	68
Quantity of butter obtained ... Lb.	6·5	12·7	6·	7·25	13·75	6·
do milk per lb. of butter "	26·	26·6	28·1	26·7	28·1	32·3
Per cent of fat left in buttermilk	·20	·50	1·30	·15	·90	2·00

These trials showed:—

(1.) A longer churning period for the sweet cream than the sour; (the mixed cream was churned in shortest time, because the revolving barrel churn, size No. 5, was a larger size than No. 2);

(2.) 14·6 per cent more milk or cream of equal quality, required to yield each pound of butter, when the cream was churned sweet, than when it was churned sour;

(3.) The buttermilk from sweet cream to contain 1·65 per cent of fat, as compared with ·17 of 1 per cent of fat in the buttermilk from sour cream.

Other experiments on this matter are in progress.

Experiments on the Heating of Milk to 150° *Fahr.*

The heating of milk and cream to the scalding point—150° Fahr.—has been undertaken in some places, to sterilize them for keeping qualities and for wholesomeness in table use. Cream has been sterilized also for the purpose of regulating the degree of acidity which would be developed in a given time by the addition of a percentage of fermentation starter of known strength or acidity. Before undertaking a series of trials in the sterilizing of milk and cream, for the purposes which have been mentioned, a few tests were made to discover the effect of scalding milk and cream to 150° Fahr., upon the quantity, odour and flavour of the butter.

THE FIRST TRIAL was made on 10th October. 350 lb. of milk were mixed, after which 190 lb. were heated to 150° Fahr. Both lots were then set in deep-setting pails, in ice-water of a temperature of 38° Fahr.

The setting period was 22 hours.

A SECOND TRIAL was made on 12th October, when 360 lb. of milk were used. The treatment was similar to that of the first trial.

Table XVIII shows the results of heating milk to 150° Fahr., before setting in deep-setting pails in ice-water, from both trials.

TABLE XVIII.

—	First trial.		Second trial.	
Quantity of milk set.......... .... Lb.	190	160	195	165
Per cent of butter-fat in milk	3·40	3·40	3·40	3·40
Temperature when set......... .... Fahr.	150°	96°	150°	96°
Creaming—				
Quantity of cream........ .... Lb.	31	30	31·5	30
Per cent of fat left in skim-milk............	1·00	·35	·90	·40
Ripening cream—				
Temperature.............................Fahr.	67°	67°	64°	64°
Per cent of fermentation starter added....	10	10	5	5
Ripening period.......................... Hrs.	10	11	16	16
Churning—				
Churning temperature.....................Fahr.	64°	64°	64°	64°
Minutes churned................................	60	100	60	90
Revolutions of churn per minute.................	65	65	65	68
Quantity of butter obtained............... Lb.	5·75	5·50	5·80	5·75
Per cent of fat left in buttermilk..................	·15	·15	·3	·3
Results—				
Quantity of fat in whole milk............. Lb.	6·46	5·44	6·63	5·61
do do left in skim-milk and butter-milk...... .... "	1·64	·49	1·55	·61
do of milk per lb. of butter........... "	33·4	29·1	33·6	29·
Percentage of fat unrecovered....................	25·38	9·01	23·38	10·87

These two trials point to the conclusions:—

(1.) When the milk was heated to 150° Fahr., before being set in deep-setting pails, 4½ lb. or 15·5 per cent more of milk was required to yield each pound of butter, than when the milk was set at a temperature of 96° Fahr.

(2.) When the milk was heated to 150° Fahr., 14·4 per cent more of the fat in the whole milk was not recovered from the skim-milk and butter milk, than when the milk was set at 96° Fahr.

(3.) In both trials the butter from the milk, which was not heated to 150°, was decidedly better in flavour and odour than the other lots.

Experiments in the heating of Cream to 150° Fahr.

The two trials in this experiment were conducted on 21st and 26th October. The main object was to discover the effect of scalding cream to a temperature of 150° Fahr., upon the odour and flavour, which are introduced into the milk and its products

from the feeding of turnips to cows. The cows were fed lightly upon turnips at first; and at the time when the milk was obtained for the second trial they were consuming 90 lb. of turnips per head per day in their ration. That excessive quantity was fed to make the trial of a treatment for expelling the turnip odour and flavour more emphatic one way or the other.

FOR THE FIRST TRIAL the milk of two days, weighing 758 lb., was set each day at a temperature of 96° in deep-setting pails, in ice-water of a temperature of 38°. From the two days' milk 140 lb. of cream were obtained. That quantity was divided into two equal portions, one of which was heated to 150° Fahr.

FOR THE SECOND TRIAL the milk of one day, weighing 387 lb., was set at a temperature of 96°, in deep-setting pails, in ice-water of a temperature of 38°. From the milk, 70 lb. of cream were obtained. That quantity was divided into two portions, one of which was heated to 150° Fahr.

Table XIX shows the details of treatment afterwards, and also the results in the quantity of the butter and the percentage of loss of the fat.

TABLE XIX.

—	First trial.		Second trial.	
Quantity of milk set.....Lb.	380	378	191	196
Percentage of butter-fat in milk	3·6	3·5	3·6	3·6
Temperature when set.....Fahr.	96°	96°	96°	96°
Creaming—				
Quantity of cream.....Lb.	70	70	35	35
Percentage of fat left in skim-milk	·45	·55	·51	·60
Cream heated to.....Fahr.	150°	65°	150°	68°
Cream cooled to..... "	50°	....	50°	....
Ripening Cream—				
Temperature.....Fahr.	65°	65°	65°	68°
Percentage of fermentation starter added	6	6	6	6
Ripening period.....Hours	14	14	14	16
Churning—				
Churning temperature.....Fahr.	61°	64°	64°	64°
Minutes churned	35	40	45	50
Revolutions of churn per minute	65	66	66	66
Quantity of butter obtained.....Lb.	14	1.35	7	7·2
Percentage of fat left in buttermilk	·4	·3	·1	·3
Results—				
Quantity of fat in whole milk.....Lb.	13·68	13·23	6·88	7·06
Quantity of fat left in skim-milk and buttermilk..... "	·78	·70	·86	·98
Quantity of milk per lb. of butter..... "	27·1	28·	27·3	28·
Percentage of fat unrecovered	13·01	12·85	12·5	13·88

These two trials point to the conclusions:—

(1.) When the cream was heated to 150° Fahr., before being ripened for churning, $\frac{8}{10}$ of 1 lb. less milk was required to yield each pound of butter than when the cream was not heated above 68° Fahr.

(2.) The percentage of fat unrecovered from the buttermilk, was practically the same in both cases.

(3.) In both trials, the butter obtained from the cream, which was heated to 150° Fahr., had no flavour or odour of turnips, and was decidedly better in every respect than the other two lots.

(4.) In both trials, the butter obtained from the cream, which was not heated above 68° Fahr., had a distinct odour and flavour of turnips, the lot from the last trial on 26th October giving a particularly strong smell and taste of turnips.

(5.) In both trials, the butter obtained from the cream, which was heated to 150° Fahr., was excellent in flavour and grain. It was rated at 37 and 36 for flavour out of a possible 40 (perfection); and at 30 (perfection) for grain.

(6.) In both trials, the butter obtained from the cream, which was not heated above 68° Fahr., was rated lower than the other lots. The points awarded to it were:—flavour, 35 and 25, out of a possible 40 (perfection);—and grain, 30 and 29, out of a possible 30 (perfection).

Note.—The butter was re-examined in glass jars, on 8th March, 1892, when the previous judgment was confirmed.

Disposal of Dairy Products.

The record of the quantities of milk received at the experimental dairy building from May—when the work there commenced—until December, and the disposition which was made of the same, is submitted herewith.

Milk received at the dairy for experimental work:

	Lb.
May	12,795
June	11,522
July	10,428
August	7,502
September	7,352
October	11,322
November	8,936
December	6,501
	76,358

	Lb.
Butter in lb. prints, sold at 22c. and 25c. per lb	1,939½
Butter in tubs and experimental jars, sold	321
do do do on hand	210
	2,470½

	Quarts.
Cream sold to residents on the farm at 20c. per quart	127½

	Quarts.
Buttermilk sold at 2c. per quart	404

The skim-milk and the remainder of the buttermilk were fed to calves and pigs.

	Quarts.
Milk sold to residents on the farm at 4c. and 5c. per quart.	6,634½

PART IV.—FORTY-ACRE LOT.

In the spring of the year it was arranged that about 40 acres of land should be set apart for the particular object of growing feed for cattle, in order to ascertain and illustrate how many cattle could be fed for the whole year upon the product of that area. In many parts of Canada an impression has prevailed that farmers

cannot keep or feed at a profit large herds of cattle unless they have large farms. In most instances the estimate is that six full-grown cattle, and an equal number of young growing stock, are as many as can be fed conveniently on the fodder and coarse grain crop of a farm of representative size, of say 55 acres of cleared land. As a matter of fact, the average number of horned cattle kept per farm is about four head of full grown animals, and an equal number of growing young stock. It appears to me that the numbers of cattle might be doubled, with increasing profit to the farmers, and decided gain to the fertility of the fields. A further extension and improvement in mixed farming, which will cause more cattle to be fed on fewer acres, is capable of great service to the whole agricultural interest of the Dominion. This experiment has been in progress for only six months of the year. The full report can be made with satisfaction only at the close of each twelve months. The following report of progress will show the areas of land under different crops, and the yields of each which were obtained. In a general way, it may be said that the yield of crops did not reach my anticipations. The corn crop was the lightest per acre which has been gathered for three years, and a disastrous hail storm on 13th August beat down the grain crops and battered the leaves of the corn to a very serious extent. The recurrence of an injury from that cause is unlikely in coming years, as it has been infrequent in past years. Continued rains during the harvest season caused further losses in the grain crops. Notwithstanding these drawbacks, the experience of the year points to the probability that 25 milch cows will be fed, wholly or nearly so, on the product of the 40-acre lot for eleven months. On 2nd July 25 cows were put in one herd, to be fed from its crops. The milk from them furnishes a supply for experimental dairy work; and feeding experiments are being conducted with them, on different rations, as described in Parts I and III of this report:—

Total Yield of Crops from 40-acre Lot.

Ripened Crops.

		Lb. of Straw.	Lb. of Grain.
8 acres, mixed crop, as in Table I		26,454	13,245
3 acres	Golden Vine Pease		905
	Goose Wheat	1,003	437
	Beardless Barley	3,102	1,373
	Banner Oats	2,790	2,060
3 acres, in 5 plots of mixed crop, similar to plots 1 to 5 in Table I		10,442	4,345
14	Totals	43,791	22,365

Root Crops.

		Lb.
1 acre, Carrots		26,785
1 acre, Mangels and Turnips	Mangels	8,110
	Turnips	9,655
1 acre, Turnips		29,584
3	Total	74,134
½ acre, Cabbage and Kohl Rabi		15,296

Cured Fodder Crops.

2 acres, Spring Rye, wilted 12 hours and put in silo, 14,080 lb.
Mixed crop, cereals, second cutting, 1,825 lb.
11½ acres, Corn, wilted on an average two days, and put in silo, 130 tons 1,750 lb.
(That is equal to 183 tons 450 lb., green weight.)
1 acre, Corn, stooked in field to cure, 11,940 lb., as weighed February, 1892.

14½

1½ acres, Corn, fed green to the cattle (from 7th August), with mixed crop.
4⅓ acres, pastured.
3⅔ acres, mixed crop, as in plots 1 to 5, fed green; nearly 1½ acres of this was used in erecting paddocks for the bulls, and the crop on it was partially spoiled by the traffic incident to the work.

The following Table and explanatory notes present the details of the different crops:—

Ripened Crops.

Eight Acres Mixed Crops.—The land had no manure applied for at least five years; it was cropped every year; it was ploughed in the fall of 1890; it was disc-harrowed twice in spring of 1891; the smoothing harrows were used on it twice. It was divided into eight plots, each one acre in size.

A different mixture of grain was sown on each plot.

Table I.

	Number of Plot.							
	1	2	3	4	5	6	7	8
Mixture sown—								
Goose Wheat .... Bush.	½	1	1	....	1	1½	....	....
Danish Chevalier Barley. "	¾	1	....	1	1	....	1½	....
Banner Oats .... "	1	....	1	1	1	....	....	1½
Golden Vine Pease ..... "	¾	1	1	1	....	1½	1½	1½
Flax .... Lb.	2	2	2	2	2	....	....	....
Total per acre....... Bush.	3	3	3	3	3	3	3	3
Date sown	April 30	April 30	April 30	April 30	April 30	April 30	April 30	April 30
Came up........................	May 12	May 12	May 12	May 12	May 12	May 12	May 12	May 12
Date when ripe................	Aug. 24	Aug. 17	Aug. 17	Aug. 17	Aug. 17	Aug. 22	Aug. 22	Aug. 22
do cut........................	do 26	do 18	do 17	do 18	do 17	do 25	do 25	do 25
Quantity of straw and grain.. Lb.	4,945	4,860	4,975	5,180	4,864	5,175	4,870	4,830
Grain from thresher .... "	1,728	1,595	1,518	1,795	1,808	1,871	1,435	1,495

Notes.—The mixtures were all sown on 30th April, and came up on 12th May. Two pounds of flaxseed were sown with the mixtures on plots 1 to 5. It ripened, and was ground with the grain for the feeding of cattle. I think at least 3 pounds per acre will give better returns.

The crop from plot 6—wheat and pease—gave the largest yield of grain per acre. That mixture of grain is also the most valuable for feeding in combination with corn ensilage. The second largest yield of grain was on plot 5, from a crop of wheat, barley and oats. I do not recommend this mixture, as I consider that every mixture should contain either pease or vetches. These latter grains do not require to obtain their supply of nitrogen from the nitrates in the soil as the other grains of the mixture do.

Owing to a severe hail storm on 13th August, and rains before and during harvest time, the crops on all the plots were very badly broken down and lodged. In consequence, a large percentage of grain was shelled on the field.

Plot 1.—Mixture of wheat, barley, oats and pease; all ripened together fairly well, excepting the wheat, which was in the doughy state when the other grains were ripe; cut with the mower, because too badly lodged to be cut with the reaping machine.

Plot 2.—Mixture of wheat, barley and pease; wheat in doughy state when other grains were ripe, 17th August; badly broken down and lodged; cut with mower.

Plot 3.—Mixture of wheat, oats and pease; wheat in doughy state when other grains were ripe; badly lodged; cut with mower, 18th August.

Plot 4.—Mixture of barley, oats and pease; badly lodged; cut with mower, 18th August.

Plot 5.—Mixture of wheat, barley and oats; wheat in doughy state when other grains were ripe; cut 17th August.

Plots 6, 7 and 8.—Mixture of wheat and pease, barley and pease, and oats and pease; all badly lodged, and cut with the mower, 25th August.

Three Acres of Grain.—The land, whereon were grown the pease, wheat and barley, was manured in the spring at the rate of from 18 to 20 tons to the acre; it was ploughed, and harrowed twice; part of the pease and wheat crops were taken in, and parts were injured by the enclosing of the bull paddocks which have been mentioned; part of the acre of barley was injured and part of the crop was killed by water standing on it; that was owing to unusually heavy rains and the failure of a drain to work efficiently; the land for the Banner oats adjoined plot 8, and received treatment similar to plots 1 to 8.

Three Acres of Mixed Crop.—The soil was of a peaty character; it received a coating of manure at the rate of from 18 to 20 tons per acre; it was ploughed in spring, and harrowed twice; the mixtures were the same as on plots 1 to 5; they were sown on 9th May and came up on 16th May; parts from the ends of each plot were cut and fed green, as mentioned in the summary of the yield of crops; three acres were left to ripen.

Root Crops.

Three acres were prepared for sowing, one acre each of carrots, mangels and turnips. The land received a coating of manure at the rate of from 18 to 20 tons to the acre. It was ploughed in the spring, harrowed twice, and set up in drills 2½ feet apart.

Carrots.—Five varieties were sown for comparison, but owing to the wet season, and water standing on part of the plot for several days, the crops were not grown under sufficiently uniform conditions to make any fair comparison of the yield per acre of the different varieties. "Steele's Improved Short White," "Giant Short White," or "White Vosges," "Green Top Orthe," "Improved Half-long White," and "Early Gem," or "Guerande," were the varieties which were sown.

Notes.—Sown 13th May; came up 26th May; pulled 30th October. Total weight of the five varieties, 26,785 lb. from one acre.

Mangels.—Five varieties were sown on 13th May and came up on 26th May. The names of the five varieties were "Pearce's Canadian Giant," "Golden Fleshed Tankard," Giant Yellow Intermediate," "Mammoth Yellow Intermediate," and "Giant Yellow Globe." From 10th June to 14th June cut-worms destroyed about two-thirds of the young plants. The spaces were sown with turnip seed on 15th June. The yield of mangels was 8,110 lb., and of turnips 9,655 lb. from one acre.

Turnips.—Five varieties of turnips were sown on 4th June. The names of the varieties were, "Improved Purple Top Mammoth," "Laidlaw's Improved," "Elephant Swede," "Hartley Bronze," and "Rennie's Prize Purple Top." They all came up 10th June. They were pulled 24th October. There was a large percentage of the turnips in one part of the plot diseased. The inside of the roots turned to a jelly-like mass, before there was any easily recognizable evidence on the outside

that decay had set in. A similar disease prevailed in the turnips on other parts of the farm, and in the vicinity of Ottawa on other farms. The total yield of the five varieties was 29,584 lb. from one acre.

Cabbage and Kohl Rabi.—Half an acre of the land, prepared in the same manner as for the roots, was sown with cabbages and kohl rabi. The cabbages were put in rows 3 feet apart, and the plants were left 2 feet apart in the rows. Four varieties were sown, viz.: "Early Drumhead," "Drumhead Savoy," "Giant Drumhead," and "Thousand Headed, or Kale." They were sown on 14th May and came up on 23rd May. Two-thirds of each variety were eaten by the turnip-flea beetle and cut-worms. The same varieties were sown in their place on 5th June and came up on 12th June. The kohl rabi suffered in a similar manner, and a re-sowing was made on 6th June. The second crop came up on 12th and 13th June. The total weight from the cabbage and kohl rabi was 15,296 lb. from half an acre.

Cured Fodder Crops.

Two Acres Spring Rye.—The land received a dressing of manure, about 18 or 20 tons to the acre; it was ploughed in the spring and harrowed twice with smoothing harrow; sown 1st May; came up 11th May; cut 15th July. When the heads were filled with grain in the doughy or late milk state it was allowed to wilt in the field for twelve hours and then put into the silo; total weight, 7 tons 80 lb. (For remarks on rye ensilage, see report on silos.) The same land was ploughed 17th July, and sown with a mixture of Hungarian grass and millet; this second crop did not come to anything worth mentioning for feed.

Fourteen Acres of Fodder Corn.—Ten acres of the land were in one block; an oat crop had been taken off in 1890. In the spring of 1891 a dressing of manure, at the rate of about 18 tons to the acre, was given; it was ploughed under, and the land harrowed twice. The soil was very uneven in its character; a part of it was a mellow, sandy loam, with streaks and patches of clay soil of a whitish colour. These patches, in some cases, were 50 feet across; about two acres of it were of a peaty character, with interruptions of loam and patches of clay. Parts of the land had been a swamp four years ago, and portions of it had been burned during the clearing. For these reasons, the yields per acre in that portion of the block did not give results which could be relied upon as guiding to a knowledge of the best practice in planting or in selecting varieties.

Four and One-half Acres were devoted to the planting of the varieties of Red Cob, Pearce's Prolific, Longfellow and Thoroughbred White Flint, (1) at rates of 2, 4, 6 and 12 grains respectively to the lineal foot, in rows 3 feet apart, and (2) in rows 3, 4 and 5 feet apart, with about 3 grains to the foot, planted by a seed-drill.

The corn was planted on 23rd May, and was cut on 16th and 17th September. It was left to wilt in bunches on the field for an average of two days before being put into the silo. The total weight after wilting, from the 4½ acres, was 49 tons 1,740 lb. From a test made on another plot, corn was found to have lost 28·5 per cent in weight by wilting in small bunches in bright sunshiny weather for two days. At that rate of shrinkage, the green weight of corn on the 4½ acres would be calculated as 69¾ tons.

One Acre of Red Cob and Longfellow was planted in rows 3 feet apart, two rows of each alternately, 18 lb. of seed per acre; cut 16th September; wilted two days; weight, 10 tons 785 lb.

One Acre of Thoroughbred White Flint and Pearce's Prolific was planted in a similar way; cut 16th September; wilted two days; weighed 12 tons 350 lb.

One Acre of Red Cob and Longfellow was planted in rows 3 feet apart, with the seed mixed before planting; 18 lb. of seed per acre; cut 14th September; wilted two days; weighed 11 tons 1,685 lb.

One Acre of Thoroughbred White Flint and Pearce's Prolific was planted in a similar way; cut 14th September; wilted two days; weighed 11 tons 1,600 lb.

One Acre of Thoroughbred White Flint and Longfellow was planted in a similar way; cut 14th September; wilted two days; weighed 10 tons 1,745 lb.

HALF AN ACRE Red Cob (corn, 5 lb. and pease 5 lb.) was planted in rows 3 feet apart. The mixture was not a success; the corn was a good crop, but the pease came up too soon and did not use the corn stalks as a trellis. The crop was fed to the cattle green.

TWENTY FEET by width of block, 562 feet, Red Cob corn and pease, were sown by ordinary seed drill with spouts 7 inches apart; corn and pease in alternate drill rows; the corn was of a variety too late in maturing to be mixed with pease; a heavy crop was obtained; fed green; this mixture of corn and pease, in same order of sowing, promises to be useful in obtaining a more complete ration for cattle than corn is in itself.

FOUR ACRES sandy loam; size of the plot, 562 x 310 feet; of it, 562 x 210 feet received a dressing of manure, at the rate of about 18 tons per acre; ploughed in spring; harrowed three times; planted in four lots, one each of Red Cob, Thoroughbred White Flint, Pearce's Prolific, Thorougbred White Flint and Longfellow; about one acre was fed green; the remainder was cut 18th September; wilted for two days and put into silo; the remainder was stooked in the field, to be used as dried and cured fodder corn.

The cutting of corn to be fed green to the cows commenced on 7th August.

Particulars and Tables, showing the comparative yields, stages of maturity, number of ears per 100 feet, and condition of the corn ensilage, will be found in Part V of this report.

Three and one-fifth acres of fall rye have been sown for feeding in the spring of 1892, and for use as ensilage during the early part of summer.

PART V.—FODDER CORN AND THE SILOS.

It is not too much to say that no single subject closely related to successfu agriculture is receiving so much attention from the agricultural press of Canada, or is creating so much discussion at conventions and meetings of farmers, as that of the growing of fodder corn and the making of ensilage. The economical feeding of cattle in stables, and the increasing of the number of cattle which are kept per farm, are matters peculiarly important to the farmers of Ontario and the provinces that lie eastward of it. The economic possibilities of fodder corn and the silo have been mentioned in connection with the fattening of steers for beef and the feeding of cows for milk, in Part II of this report. This brief chapter is presented for the purpose of indicating how the farmers in every district may obtain the largest service from this crop. No specific rule or direction will be found applicable to all soils, districts or seasons; but in all districts, in nearly all soils, and in every season, the corn crop will yield the farmers in the provinces which I have mentioned feeding material for their cattle during the winter, with more profit and advantage than any other single crop which can be grown with as little labour and exhaustion to the fertility of the land, and which can be saved in a cured condition as conveniently.

On one plot on the farm, 68 varieties of corn were planted in rows 3 feet apart—two rows of each—to a length of 90 feet. They were planted on the 21st of May and came up from 1st June to 4th June. They were all cut on 12th September. The average yield, weighed green, was 17 tons and 47 lb. per acre. Particulars on the comparison of varieties for one season only are apt to be rather misleading. Some of the varieties, which gave excellent results on the farm during the two previous years, and did equally well on other parts of the farm in 1891, did not turn out so well on this experimental plot; but, taking the plots on the whole farm, the results as published in Bulletin No. 12, prepared by Prof. Saunders, can be taken as agreeing with the results for the season of 1891. The following short extract is taken from that bulletin:—

"From the results given, it would appear that the Thoroughbred White Flint, Long White Flint, Long Yellow Flint, Yellow Dutton, Large White Flint, Pearce's Prolific and Longfellow, are the most productive of the Flint varieties, ranging in

yield in the order named, and all of them, excepting the Long White Flint, attained a sufficient degree of maturity to make excellent ensilage.

"Among the different sorts of Dent corn, none of which, however, mature as well as the Flint varieties, the following have been found to yield the greatest weight of crop:—Virginia Horse-tooth, Golden Beauty, Golden Dent, Blunt's Prolific, Mammoth Southern Sweet and Red Cob Ensilage.

"Many sorts of sweet corn have given a large yield, the most prolific being Mammoth Sugar, Crosby, Eight-rowed Sugar, Egyptian Sugar and Asylum Sweet. The earliest ripening among these is the Crosby."

On a plot adjoining the one where the 68 varieties were planted, Thoroughbred White Flint was planted in hills 3 feet apart. Two rows of it of an equal length, from the hill method of cultivation, gave at the rate of 4 tons 250 lb. per acre larger yield than two rows under the drill method of cultivation, grown close by. It would not be prudent to base a general conclusion on the result of this one comparison. The method of cultivation in hills seems to permit of the formation of a larger number of ears on the stalks, and a rather earlier maturing of the crop.

From the corn which was grown on the 40-acre plot, already reported upon, some information bearing upon the comparative value of the crop of corn at different stages of maturity has been obtained. The stage of maturity reached has been recorded at the "tasselling," "silking," "early milk," "late milk" and "glazing" stages of growth.

The following Table illustrates the number of ears and nubbins, obtained from planting in rows 3 ft., 4 ft. and 5 ft. apart, with from 3 to 4 grains per lineal foot in the rows:—

TABLE I.

Number of Ears and Nubbins, in rows 100 feet long, on 15th September.

Varieties.	Distance of Rows apart.					
	Three Feet.		Four Feet.		Five Feet.	
	Ears.	Nubbins.	Ears.	Nubbins.	Ears.	Nubbins.
Red Cob	20	49	16	95	22	109
Pearce's Prolific	102	22	91	20	143	39
Longfellow	87	23	121	30	134	34
Thoroughbred White Flint	13	51	45	48	63	59
Average	50	36	68	48	90	60

While the rows 5 feet apart showed the largest number of ears and nubbins per lineal foot in the rows, the three different methods of planting gave nearly the same numbers each per acre.

Information on the comparative percentages of water, dry matter, yields per acre, dry matter per ton, and dry matter per acre, at the different stages of growth of the four varieties, "Longfellow," "Pearce's Prolific," "Thoroughbred White Flint," and "Red Cob," are found in the following Table:—

TABLE II.

Name of Variety.	Planted.	Tasselling.	Silking.	Early Milk.	Late Milk.	Glazing.
Longfellow........	May 23.....	Aug. 1 ...	Aug. 11....	Aug. 27....	Sept. 10....	Sept. 21....
Pearce's Prolific..........	do 23.....	do 3. ..	do 13. .	do 29....	do 12....	do 22....
Thoroughbred White Flint	do 23.....	do 18....	do 25....	Sept. 22....	Oct. 3....	....
Red Cob...............	do 23.....	do 22....	Sept. 2....	Oct. 3....	....	....

Per cent of water in green plants	85·73	83·8	80·0	77·8	73·8
do dry matter in green plants..	14·27	16·17	19·95	22·14	26·18
Yield per acre (green weight) ..... Lb.	45,329	48,052	45,806	42,759	43,154
Dry matter, per ton of green corn.. do	285	323	399	443	524
do per acre .. .. do	6,468	7,770	9,138	9,467	11,298

These figures point to a very large increase in the weight of dry matter per acre as the corn approaches the ripe condition.

The analyses of these varieties of corn and the calculations have been made by Mr. F. T. Shutt, Chief Chemist. A more extended analysis of the corns will doubtless appear in his Report for 1891 or 1892.

Corn of the same four varieties was also grown under a method of cultivation with from three to four grains to the lineal foot, in rows of 3 feet, 4 feet and 5 feet apart, respectively, in each case. The following Table shows the average yields per acre which were obtained from the different methods of planting :—

TABLE III.

Weights of four varieties of Indian Corn sown in rows 562 feet long. Four rows of each variety were sown at the distances of 3 feet, 4 feet and 5 feet apart, respectively.

The corn was wilted two days before weighing.

Varieties.	Distance of Rows apart.		
	3 feet.	4 feet.	5 feet.
	Lb.	Lb.	Lb.
Red Cob	2,970	5,330	5,305
Pearce's Prolific	2,568	2,800	4,470
Longfellow.	2,464	3,430	4,110
Thoroughbred White Flint.....	3,058	4,270	5,190
Average per acre.......	17,857	19,154	18,479

Taking into account the convenience of cultivation, the keeping down of weeds, and the quality of the stalks, it appears that the best results are obtained from planting in rows 3 feet or 3½ feet apart, or, better still, in hills 3 feet apart each way.

The same four varieties of corn were also planted in rows 3 feet apart, at the rates of 2, 4, 6 and 12 grains per lineal foot in each row. The land on which they were grown was so irregular in character that no fair comparison of the yields that may be obtained per acre from these different methods of planting could be made. A brief report of the quality of the ensilage from these methods of planting the corn will be made.

These four varieties of corn were also planted in different combinations (1) two rows of each alternately, and (2) two of the varieties mixed in each row. The following Table shows the results obtained from these investigations :—

Table IV.

Method.	Varieties.	Stage of Growth.	Weight per Acre, wilted.	Green Weight per Acre. (Calculated)
			Lb.	Lb.
Two rows alternately.........	Red Cob.............. ..... Longfellow	Silking......... Late milk.......	20,785	29,099
Two rows alternately.........	Thoroughbred White Flint .. Pearce's Prolific............	Early milk.. ... Late milk.... .	24,350	34,090
Seed mixed before planting...	Red Cob...... .... Longfellow	Silking......... Late milk..... .	23,685	33,159
do do ...	Thoroughbred White Flint... Pearce's Prolific...........	Early milk...... Late milk... ..	23,600	33,040
do do ...	Thoroughbred White Flint .. Longfellow	Early milk..... Late milk.....	21,745	30,443

These five acres were all planted on 23rd May, cut on 12th September, and wilted for two days. The green weights per acre would be about 40 per cent more than the wilted weights.

There does not appear to be any advantage from the planting of different varieties in alternate rows, nor from the mixing of varieties in the same rows.

The heaviest yield on a single acre of corn was one acre of Thoroughbred White Flint, which weighed, after two and a-half days' wilting, 12 tons 900 lb.

Condition of Ensilage.

In silo No. 1 there were 116 tons and 1,259 lb. of mixed varieties, odd plots, and Thoroughbred White Flint. The silo was opened on 10th October. It had been covered with a layer of straw to a depth of about 18 inches. On the top it was spoiled to a depth of about 2 inches, and there was of spoiled and mouldy ensilage 3,333 pounds. The total weight of waste ensilage from this silo, besides that found on the top, was 100 pounds. The corn for this silo was cut in lengths fully 1 inch long. The cattle refused to eat portions of the larger stalks, and also portions of the cobs.

In silo No. 2 there were 95 tons 1,135 lb. It also was covered with a layer of straw. There was spoiled and mouldy ensilage on top for a depth of 2 inches, which weighed 2,694 pounds. The surface area in both silos was 18 feet x 16 feet. Different

lots of corn, according to the method of planting under which they were grown, were put in separate layers. They were divided from each otherby a layer of uncut corn stalks.

The first layer was one of ensilage from Red Cob corn, grown in rows 3 feet, 4 feet and 5 feet apart It had barely reached the " early milk " stage when cut. The sample was in only medium condition as to preservation.

The next layer was that of the four varieties of corn planted in rows 3 feet apart, with 12 grains to the lineal foot in each row. It had been allowed to wilt in the field until it had become rather dry. When it was taken from the silo it was in fairly good condition, but so dry that the meal of the ration would not adhere to it.

The next layer of ensilage was from the four varieties of corn planted in rows 3 feet apart, with 6 grains to the lineal foot in each row. This layer was found to be in an excellent condition as to preservation, but was rather dry from too much wilting.

The fourth layer of corn in this silo was from four varieties of corn planted in rows 3 feet apart, with 4 grains to the lineal foot. The ensilage was in an excellent state of preservation, and was not quite so dry in condition as the two layers above it. This silo was then closed for several weeks. Before this writing (February) it has been reopened. On the top was found a layer of mouldy ensilage, which weighed 2,840 pounds.

The fifth layer of the silo was from the corn of four varieties, planted in rows 3 feet apart, with 2 grains to the lineal foot in each row. This sample was of better quality, and in better condition as to preservation, than the ensilage from the same varieties of corn, planted with 4, 6 and 12 grains to the lineal foot in each row, respectively. The contents of silo No. 2 are being fed at this writing.

Silo No. 3 was constructed on the barn floor. Like the other silos, it is lined inside with two plies of lumber with paper between. The ensilage in it also was covered with straw; and there was of spoiled ensilage on the top a weight of 2,130 pounds. Its area is 15 feet by 15 feet. In a comparison between the condition of the ensilage in this silo, from the three varieties of corn, each grown in rows 3 feet apart, 4 feet apart and 5 feet apart, that from the corn grown in rows 4 feet and 5 feet apart, respectively, was found to be in the best condition. That appeared to be attributable to the fact that the stalks were rather more matured, and, as shown in Table I, carried a larger number of ears each. This silo is located over the stable, on a stout, 3-inch plank floor. A considerable quantity of ensilage was spoiled in the bottom of the silo.

Ensilage from Mixed Crops.—Some ensilage was made from a crop of mixed grain (oats, barley and pease)—grown in the summer of 1890. It was put into the bottom of the silo, and about 100 tons of green corn were put on top of it. After the corn was fed, the mixed crop ensilage came out in most excellent condition, and was fed to the cattle and calves as late as May and June.

Pease Ensilage.—In the autumn of 1890 part of a crop of pease was cut, when the pods were filled but not ripe, and put into the silo, to determine the value of such ensilage for the feeding of young pigs. The results are recorded in Table 2, in Part II of this report. The pease ensilage was fairly well preserved; but it gave off a very strong smell of ammonia whenever the surface was disturbed.

Rye Ensilage.—A crop of rye from two acres, weighing 7 tons 80 pounds, was put into the silo on 16th July, 1891. Feeding was commenced immediately. It had been allowed to ripen and wilt rather too much; in consequence, a portion of it became quite dry, and was not relished by the cattle. For the making of rye ensilage, the crop should be cut decidedly on the green side, and put into the silo without very much wilting.

Clover Ensilage.—A quantity of second crop clover was cut and put into the silo. It was put into the silo without being run through a cutting-box; in consequence, it packed rather loosely and unevenly, with holes and spaces in places. These became slightly mouldy. The bulk of the clover, however, is well preserved and is relished by the cattle.

Conclusions.—In the making of ensilage from mixed crops, rye or clover, it is desirable to put the crops into the silo in a green and succulent condition. They should be run through a cutting-box, to provide for even distribution and close packing. They must be weighted heavily, either by the application of artificial pressure, or by being put into the bottom of a silo, which will be filled shortly afterwards with corn ensilage. The interstitial spaces between the fine stalks of such crops as oats, pease, rye, clover and grass, hold sufficient air to cause them to mould or decay, unless pressure be applied to expel it. The silo offers a convenient place for the saving of such crops, when the weather is unfavourable, but the lighter yield which can be obtained of them per acre hinders them from being as profitable to grow for ensilage as a crop of corn, wherever that can be grown to the "late milk" or "glazing" stage of maturity.

The experience of the season points to the following conclusions in regard to the growth of corn, the construction of silos, and the filling of the same :

Soil.—If a field with a loose, warm, loamy soil be convenient to the silo, and can be used, it should be selected in preference to heavy clay, or cold soils. Sod may be ploughed under, shortly before the crop is planted, with the probability of good results from that method of preparation. In all cases, the land should receive a liberal dressing of barnyard manure, be ploughed in the spring, and be harrowed to a state of fine tilth before the corn is planted.

Seed.—The vitality and vigour of growth of the variety of corn which has been selected should be tested. The putting of a few grains in a flower pot in a warm place in the house will enable any farmer to verify for himself these qualities in his seed grain. Frequent disappointment results from neglect in testing the vitality of corn before planting it. As a general rule, the variety which will yield the largest weight per acre, and reach the "glazing" stage of maturity before the frosts come, is the one to select for any district. The "glazing" stage may be otherwise described as the stage when the corn is just past its best condition for boiling in the ear for table use. It is better to err on the side of selecting a variety of a habit of small growth, which certainly will reach the glazing stage, than a variety of large growing habits, which may not come to the desired stage of maturity.

The maximum quantity of seed per acre may be put at 25 pounds; excellent results have been obtained from the planting of 18 to 20 pounds per acre.

Manner of Planting.—Planting in hills, 3 feet apart, both ways, appears to afford the corn a better chance for maturing early, and for producing a large number of ears. A hand corn-planter may be used to dibble in the corn. From 4 to 6 grains per hill should be planted. Corn may also be planted by the use of a hoe, and covered to a depth of at least 2 inches. In that case the foot should be pressed on the soil over the corn. For small areas, furrows 3 inches deep may be ploughed 3 feet apart. A marker (which may be constructed by driving wooden pins or harrow-teeth through a plank at distances of 3 feet from each other), may be drawn across the furrows. From 4 to 6 grains may be dropped at the points of intersection. They can be covered quickly and well by the planter's foot. For large areas, a single or double horse corn-planter may be used with advantage. The planting of corn in hills affords an opportunity for the effective cleaning of land from weeds, without much hand labour, by permitting cultivation in both directions.

If planted in rows, the rows should be from 3 to 3½ feet apart, and the grains may be put in at rates of 3 to 4 grains per lineal foot. For small plots, a convenient method is to open a furrow with a plough; the seed may be dropped in at the rate already mentioned, when it may be covered. For large areas, a single or double corn-planter will be found a serviceable implement.

Depth.—Corn seed should be planted to a depth of from 2 to 3 inches.

Cultivation.—In cases where a crust forms on the land, before or immediately after the corn comes through, a light harrowing will prove very helpful to the vigour and growth of the crop. Harrowing of the corn until it is 6 inches high will increase the rapidity of growth and the yield per acre. The cultivation between the rows, when the plants are small, should be close to them, and deep. When the

plants have grown to a height of more than 3 feet the cultivation should be more distant and shallow, in order to avoid injuring the side roots of the plants.

SILOS.—The main features that are required in a silo are strength to resist the outward pressure of its contents, exclusion of air by the construction of the sides, and a fair depth of holding capacity, in order to permit the ensilage to settle into a compact mass. Sufficient strength of sides can be obtained in most silos by the use of 2 x 10-inch or 2 x 12-inch studs, placed from 18 inches to 2 feet apart. A clay or earthen floor is most economical, and as good as any that can be put in. The inside of the walls of the silo may be finished by a single lining of lumber, nailed to the studs horizontally. The lumber should be tongued and grooved and dressed on the inside. If each alternate board be allowed to extend at the corners, so as to make a lock-joint, that will give additional strength to the structure. The corners of the silo, on the inside, should be filled by the use of a board or plank 10 inches wide, set on end. The triangular space behind it should be filled with sand or sawdust. I consider that studs 2 x 10-inch or 2 x 12-inch, with one ply of sound tongued and grooved lumber, nailed horizontally on the inside, are sufficient for an efficient preservation of the ensilage. Additions to that method of construction may be advantageous, in a few cases, for convenience. If a portion of the ensilage around the sides becomes frozen, that is more an inconvenience than a loss. It should be mixed with the warm ensilage, from the middle of the silo, before it is offered or fed to the cattle.

CUTTING THE CORN.—The cutting of fodder corn by hand has been found the most economical of the methods which we have tried. If the crop be allowed to wilt in the fields, until it loses from 15 to 20 per cent of its moisture, a pleasant aromatic odour will be developed, which leaves the ensilage with a more agreeable smell. From an examination which was conducted with two tons of corn, left to wilt in the fields, in small heaps of about twenty-five or thirty stalks each, it was found that, with two days' exposure during bright sunshiny weather, the corn lost 28·5 per cent of its weight; and with four days' exposure, 36·8 per cent. After twenty-eight days standing in "stooks" it had lost 52 per cent; and after five months it had lost 58·8 per cent of its original green weight.

FILLING THE SILO.—It is advantageous to cut into the silo those varieties of corn which have thick stalks, in lengths of from ½ to ¾ of an inch. Cut into such lengths there is no waste, and the stalks and cobs are all eaten up clean by the animals. Provision should be made for a fairly even distribution of the corn in the silo, while it is being filled, and for tramping the sides and corners most thoroughly. The weighting of the corn does not appear to be necessary or advantageous. After the silo is filled the surface should be levelled and thoroughly tramped; and after the lapse of *not more than one day* it should be covered to a depth of 6 inches with cut straw. If a foot of cut straw be put on top of that a few days later, probably no loss at all from waste ensilage will be found on the opening of the silo for feeding. The feeding should be effected from the top of the ensilage, and a quantity of the exposed ensilage should be raked from the top daily.

ANNUAL REPORT OF THE HORTICULTURIST.

(JOHN CRAIG.)

To WM. SAUNDERS, Esq.,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith a report of the work carried on in the horticultural department, for the year 1891.

The season while on the whole unfavourable to nursery work and transplanting operations, will long be remembered throughout the Dominion as a year marked by a fair crop of fruit of first quality, the dryness of early spring being unfavourable to the development of apple scab and other fungous diseases. The unusual heat of September had the effect of hastening the maturity of late summer and autumn varieties, which lead to a lowering of market prices, by the consequent haste on the part of growers to get rid of this class of fruit. To provide against such contingencies, more attention will need to be paid by growers to the production of a commodity of higher quality, placed upon the market in the neatest, most convenient and attractive way. This in part may be accomplished by closer attention being paid to cultivation and spraying of trees, thinning, grading and packing of fruit; and as our fruit interests develop, cold storage will undoubtedly play an important part in the profitable disposal of the different orchard products.

In drawing up this report, which has been done in as concise and brief a form as possible consistent with clearness, I have followed the plan adopted last year—that of dividing the work and placing it under different heads.

I. LARGE FRUITS.—Gives notes on orchard culture with special reference to the needs of northern planters, together with suggestions, preventive and remedial, for the treatment of trees injured by mice or rabbits during winter. Particular attention has been given during the year to collecting information in regard to the most valuable varieties of the Russian apples, so far as experience up to this point can guide. The varieties mentioned have been carefully selected, and are commended to the attenion of northern orchardists.

II. SMALL FRUITS.—Under this head will be found some conclusions reached in regard to methods of planting; facts concerning winter protection, and relative profitableness of varieties. Considerable space is given to grapes, covering tabular information, as to time of colouring and ripening; also descriptive notes of varieties.

III. VEGETABLES.—Giving the names and descriptions of varieties in the following classes, which succeeded best in the experimental plots: Beets, cabbage, cauliflower, celery, pease, peppers and tomatoes; also some results from the use of fertilizers upon the latter.

IV. FORESTRY.—A report upon the work of distributing young seedlings, and tree seeds to the prairie provinces.

V. FUNGICIDES.—Giving results of experiments in spraying to prevent "apple scab," "grape" and "gooseberry mildew."

ACKNOWLEDGEMENTS.

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Mr. W. W. Dunlop, Montreal—Small fruit plants, plum trees and scions; seeds of East India plants.

Stayman & Black, Leavenworth, Kans.—Ten new varieties of grapes for trial, six Stayman raspberry plants.

W. P. Rupert & Son, Seneca, N.Y.—Two trees of Vermont Beauty Pear.

Mr. W. H. Phillips, Staunton, Ind.—One dozen Phillips' No. 1 strawberry.

Mr. A. M. Smith, St. Catharines, Ont.—Smith's Giant Raspberry.

Mr. W. W. Hilborn, Leamington, Ont.—Greenfield Red Currant.

Rev. Robt. Hamilton, Grenville, Que.—Apple scions.

Fitz-james Pear Co., Himrods, N.Y.—Two Fitz-james pear trees.

Mr. R. B. White, Ottawa.—Seedling plums.

Mr. J. P. Cockburn, Gravenhurst, Ont.—Seeds and roots of Witch-hazel and Muskoka June berries.

Chase Bros. & Co., Rochester, N.Y.—Two trees of North Star apple.

Prof. J. L. Budd, Ames, Ia.—Scions of Russian apples and pears.

Linus Woolverton, Esq., M.A., Grimsby, Ont.—Small fruit plants, and much valuable assistance in various lines.

I have also to acknowledge with thanks valuable assistance from Mr. Wm. Craig, jun., and Mr. J. M. Fisk, of Abbotsford, Que., in conducting experiments for the treatment of "apple scab."

MEETINGS ATTENDED.

During the winter I had the opportunity of meeting farmers at institute work in various places throughout the Province of Ontario, and was pleased to note the growing interest in fruit culture, manifested by their efforts to gain all information possible in regard to newer varieties and improved methods of cultivation.

By courtesy of the Hon. Minister of Agriculture I had the privilege of attending the twenty-third biennial session of the American Pomological Society, held in Washington last December. The work of revising fruit lists for the whole union, and passing on the continuous stream of new varieties being pressed upon the public, are among the functions of this society.

Three days were spent very profitably in session with the Ontario Fruit Growers' Association, at their winter meeting in Hamilton in December. The important part this society is taking in furthering the fruit interests of the Dominion, as well as the Province of Ontario, is very meritorious, and should receive the hearty co-operation of all interested in fruit-growing, wherever located.

I have the honour to be, Sir,
Your obedient servant,
JOHN CRAIG,
Horticulturist.

I.—LARGE FRUITS.

APPLES.

The winter of 1890–91, though not remarkably severe on the whole, was yet unusually trying on trees and plants having terminal wood not well ripened, particularly young nursery stock. The sudden fall of temperature in the latter half of December, 1890, to 15° below zero, and this at a time when there was no protecting blanket of snow, caused root-killing to a considerable extent in the case of one and two-year-old nursery stock, especially in light soils. In many instances, with root grafts, the lower root section was entirely killed; the young tree when not killed, being supported by the upper and hardier roots emitted from the scion. This state of affairs was particularly noticeable with many of the Russian varieties in nursery here. As a consequence, quite a percentage of one-year-olds was killed. Nursery stock on heavier soil did not suffer to the same extent.

Planting Season.—With practically no rainfall during the month of May and up to the last half of June, the spring season, with its drought and cold winds, was extremely unfavourable to planting and transplanting of all kinds, as well as to the best returns from small fruit plantations. The heavy rains of July and August

induced a later growth than usual in trees and shrubs, more especially affecting root grafts and young nursery stock not previously well rooted.

Cultivation.—The same system of cultivation in orchard management has been continued as that outlined in my report for 1890.

INJURIES FROM MICE.

Owing to the great amount of damage sustained by young orchards throughout the country during the past winter, many questions have come in relating to the best and cheapest means of repelling the attacks of field mice. As varying conditions often call for different treatment, the following preventives and remedies are suggested:—

Preventives.—1. Remove all rubbish that may lie about the orchard affording hiding places for mice.

2. Tramp the snow firmly about the trees after each snow storm.

3. In the autumn, before the ground freezes, bank each tree with earth to the height of from 12 to 15 inches. This was done the past season to the 1,700 trees in the orchard of the Central Experimental Farm, at a cost of ·53 cents per tree, or a little over a half of 1 cent.

4. Tarred paper, which has been allowed to dry for a few days after being cut into squares of the required size, is also very serviceable. It may be fastened round the stem of the tree with twine, or may be held in place by a single carpet tack, pressed through the over-lapping edges into the bark.

Washes.—5. Portland cement of the consistency of common paint, to which is added Paris green in the proportion of 3 or 4 oz. to 3 gallons of the former. Apply with a brush, as a paint.

6. Slake 1 peck of fresh lime and make to the consistency of paint, adding half a gallon of soft soap, half a gallon crude carbolic acid, and 3 or 4 pounds of sulphur.

Remedial.—1. In all cases with a sharp knife pare the wound smoothly. If the wound is 18 inches or more from the ground, cover completely with a thin coating of grafting wax, and wrap with a cloth to prevent wax melting, and to assist in excluding the air.

2. When the wound is near the base of the tree, cover with grafting wax or green cow-dung, held in place by rough sacking; or the tree may be banked with earth to a point above the wound, which is preferable.

The main idea is to prevent evaporation by excluding the air, and keeping the tissues in a normally moist condition. Under such circumstances, when taken in time, trees will frequently recover, though completely girdled.

I wish to again impress the importance of keeping the bark on the stems and branches of the young trees in a clean and healthy condition, by the application of alkaline washes. Apart from preventing injury from scale insects, such washes repel the inroads of borers to an extent not generally appreciated. In looking through an orchard of 100 acres, chiefly made up of Duchess, the property of Messrs. Bardwell and Haviland, of Fort Dodge, Iowa, I could not, after the most careful examination, find a single tree injured by borer, or affected with sun-scald This result Mr. Haviland attributes entirely to the systematic and regular application of such a wash as is recommended in my report of last year. The cost will vary from 30 to 50 cents per hundred trees for the season.

Low Heads.—Another point which I wish to emphasize in connection with orcharding at the north is the importance of heading the trees low and growing somewhat in bush form. The experience of Messrs. Bedford and Mackay, of Brandon and Indian Head, bears strong and unmistakable evidence on this point—a larger percentage in every case of standards of the same varieties failing than those planted as one-year-olds and allowed to branch low. In climates subject to sudden extremes, long-unprotected stems are very liable to suffer injury from sun-scald and bark-bursting. Again, the low head, from its proximity to the ground, assists in collecting snow, which does valuable service to the object covered in protecting it from extremes of

temperature. To intending planters in northern Ontario and Manitoba I would say, purchase one-year-old root-grafted trees, selecting varieties as hardy or hardier than Duchess, cut them back and set in nursery row, for two years, then set out in permanent orchard situation, and train in low bush form. More lasting benefit will be gained from this class of tree than from the much finer looking standards, which may have been forced in nursery.

NEW VARIETIES.

Among the many new varieties which are being constantly heralded from different points, it is often difficult to discriminate between the useful and useless. Of the many aspirants for public recognition I think none more worthy than that known as "McMahon's White." The fruit of this was exhibited at the last meeting of the American Pomological Society in Washington, grown both in Wisconsin and Minnesota. A large oblong waxy yellow apple, with a light blush on one side, flesh white, juicy and of fair quality. A dozen trees of this on the experimental farm are among the most vigorous and healthy in orchard. Mr. A. L. Hatch, of Ithaca, Wisconsin, writes me as follows: "A seedling from Alexander introduced here about 20 years ago, and is proving more valuable than any other. It will grow and bear apples 'next year' when other varieties are tired out. I had 80 barrels of it this year—sold higher in Chicago and St. Paul than any other of its season."

STANDARD VARIETIES ADDED, 1891.

Arkansas.	Kinnaird's Seedling.
do Black.	Lankford do
do Beauty.	Mason's Orange.
Crawford.	Nero.
Clayton.	Osceola.
Coffelt Beauty.	Rainbow.
Cullin's Keeper.	Rebel.
Dickinson.	Shackelford.
Dr. Walker.	Spencer.
Early Colton.	Stuart's Golden.
Family Favourite.	York Imperial.
Huntsman.	North Star.
Ivanhoe.	Gano.

As the majority of the varieties mentioned above are from points considerably to the south of Ottawa, it is not expected that they will in all cases prove hardy, but opportunities are not wanting whereby their usefulness for southern Ontario can be determined.

In the accompanying tabular statement a classification of varieties now in the standard orchard is made on the basis of relative immunity from injury, during the winter of 1890-91. Those in column 2 "slightly injured," lost in most cases only a few inches of the terminal growth. In column 3 the injury was more severe, and was often accompanied by sun-scald and stem injury. In column 4 will be found varieties which seem to have died from unadaptability to soil and climate—the latter particularly—and which in this and similiar localities should only be tried as top-grafts in a limited way, if at all.

TABLE showing effect of Winter of 1890-91 on Standard Apple Orchard.

1. Uninjured.	2. Slightly Injured.	3. Considerably Injured.	4. Killed.
Baxter	American Beauty	Baldwin (American)	Cooper's Market.
Ben Davis	Belle de Boskoop	Bottle Greening	King (3 out of 5).
Bombarger	Brewington	Cranberry Pippin	Lady Henniker.
Canada Baldwin	Benoni	Early Harvest	Nonpareil.
Duke of Connaught	Beauty of the World	Gravenstein	Perry Russet.
Duchess	Chenango Strawberry	Hurlbut	R. I. Greening.
Fameuse	Dominie	Missouri Pippin	Red Russet.
Fanny	Fallawater	Nodhead	Swayzie Pomme-grise.
Golden Russet	Lord Suffield	Rome Beauty	Winter Bough.
Gideon	Magog Red Streak	Shannon	
Giant Swaar	Northern Spy	Sweet Bough	
Haas	Primate	Sutton's Beauty	
Keswick Codlin	Ribston Pippin	Utter's Red	
Lawver	Rolfe	Vandevere	
McMahon White	Red Beitigheimer	Wagener	
McIntosh Red	Roxbury Russet	Wine Sap	
Mann	Stump	Winter Pippin	
Orange Winter	Seek-no-further		
Princess Louise	Sharpe's Russet		
Pomme Grise	Spitzenberg		
Peach	Sops of Wine		
Plumb's Cider	Wolf River		
Red Astrachan			
Richards' Graft			
St. Lawrence			
Snyder			
Shiawassie Beauty			
Saxton			
Scott's Winter			
Salome			
Talman's Sweet			
Wealthy			
Walbridge			
Winter Duchess			
Winter St. Lawrence			
McMahon's White			

RUSSIAN APPLES.

The work of testing the merits and studying the habits of this race of apples has been carried on during the year, as much as opportunity and time afforded. To more rapidly advance this line of investigation, a visit by the writer was made last autumn, to the western States, by instruction of the Honourable the Minister of Agriculture. Some of the information gained from this visit, as well as the combined experience of the most careful experimenters are here given, in such form as may serve as a guide to propagators.

Conclusions reached are (1) that the northern limits of apple culture can be materially extended by planting the hardiest of these varieties.

2. That all fruit-growing districts of Canada may be benefited by adding a judicious selection of the best kinds.

3. That among them are many valuable summer varieties.

4. That experience seems to indicate that among them are winter apples of fair quality and superior hardiness.

5. That in the milder portions of Ontario, these winter apples are not yet sufficiently tested to be recommended for more than trial, in a limited way.

6. That nursery men supplying the needs of northern planters should propagate varieties mentioned hereafter, taking special care to send them out true to name.

SUMMER.

ANISOVKA (*No.* 185 *Dept.*)—A large fine looking apple of the Duchess type, but about two weeks later. The tree is extremely hardy, and is recommended for trial where the Duchess fails. It is spoken of in Minnesota as an early fall apple of great promise.

YELLOW TRANSPARENT (*No.* 334 *Dept.*)—This has now become so widely and so favourably known, that it is almost superfluous to insert it in this list. It has been mentioned as one of the leading apples in almost every list received, from Minnesota to Vermont. Its weak point in the western States is its liability to suffer from blight. Of its hardiness, quality of fruit, and early heavy-bearing habits, there is no question; in fact, this latter characteristic has been the means of bringing it thus rapidly before the public. Experience teaches that this variety needs high cultivation and careful thinning of fruit, in order to maintain a product of first quality, and perfect vigour of tree.

BRESKOVKA (152 *M.*)—One of the Moscow importation by Prof. Budd. This fruited as a top graft last year in the Niagara district, but was past its season when I saw it early in September; and in speaking of it, I do so principally on the recommendation of others with whom it has fruited. The tree is hardy at Ottawa, as it is in Iowa and Minnesota. As a dessert fruit, a week or two later than Yellow Transparent, it is highly spoken of.

ENGLISH BOROVINKA (9 *M*).—Imported by Prof. Budd. Fruited at Abbotsford the past two years. Medium to large; flat conical; yellow ground; nearly covered with splashes and red stripes. Calyx partly open; basin large, wrinkled; stem three-quarters to an inch long; cavity narrow, deep and russeted. Flesh white, with sometimes a purplish tinge, sub-acid, fair quality. Season, September; keeps till November. A handsome early fall apple. Hardy in Minnesota. This is quite different from Borovinka, No. 245 of the Dept., which is not included in this list, as its place seems to be filled by Anisovka (*No.* 185 *Dept.*)

CHARLAMOFF (262 *Dept.*)—A hardy tree, of which favourable reports came from Minnesota, Iowa and Wisconsin. It is also doing well in various parts of the Province of Quebec, and at Ottawa. Fruit large, rather handsome; of the Duchess type in appearance, quality and season.

WHITE NALIV (*No.* 157 *Dept.*)—This fruit answers the description of Dr. Regel, as translated by the late Chas. Gibb. He says: "It stands our severest winters at St. Petersburg, and bears every year; at any rate, *heavily* every second year." Mr. Tuttle says: "A most valuable tree in orchard, hardy and free from blight." Good reports come from various points in Iowa as well. Fruit about medium size, yellow ground, sometimes quite highly coloured; fair quality. Ripens here about the middle of August.

BLUSHED CALVILLE (22 *M*).—Hardy at Ottawa. Recommended from Minnesota and Iowa as a summer apple; a little later than Yellow Transparent, and a better tree. Mr. Peterson, of Minnesota, says: "Hardy, free from blight; better than Duchess."

LUBSK REINETTE (444 *Dep.*)—"Is a summer apple, having juicy white flesh; fair to good in quality; fine-grained and good size; round in shape; suffused with carmine red over a white waxy ground; far more beautiful than any other apple I ever saw of any kind. For two seasons I sent them in barrels to St. Paul, Minn., and they sold at a higher price than any other kind and more were asked for each time. The tree is as good a grower as Duchess, not very fine in nursery, but good in orchard, though in some instances it blights slightly, not more, however, than Fameuse; also has scabbed, but very little when compared to Fameuse. For an early, fancy, high-priced apple, for a gilt-edged market, it is sure to be satisfactory and liked; it can be well grown in your climate, where the summer heat is probably not so intense as here."—A. L. Hatch, Ithaca, Wis. This has not fruited in Canada that I am aware of, but the tree is doing well at Ottawa and Abbotsford, Que., and should be more generally tested.

THALER (*No.* 342 *Dep.*)—This is thought by a few growers to be identical with Yellow Transparent, Mr. Tuttle, of Wisconsin, claiming the fruit to be the same, but the tree less liable to blight. Mr. Speer, of Iowa, thinks the tree more productive, but we in Canada have no fault to find with the Yellow Transparent in that respect. In my opinion, for Canadian planters, one is as good as the other, the fruit being so nearly alike, and the trees being equally hardy.

LIVLAND RASPBERRY (*No.* 340 *Dep.*)—This bears an attractive-looking fruit of fair quality, ripening about 1st September. The tree ranks with Wealthy in hardiness, but is not as thrifty in growth. It has been recommended in Wisconsin, and succeeds well in the Province of Quebec.

FALL.

WHITE PIGEON (317 *Dep.*)—Tree undoubtedly hardy. The wood of this variety is among the brightest and clearest in a string of nearly two hundred specimens, made up of cross sections of the stems of three-year-old nursery trees, taken at the critical point—the terminal bud of the first year's growth—presented to the Iowa Horticultural Society, after a recent test winter, by Mr. W. C. Haviland, of Fort Dodge. Mr. Webster, of Vermont, briefly describes the fruit as "a good substitute for the banana." Emphatic statements come from Minnesota in regard to its hardiness, and Mr. R. W. Shepherd has the following to say in regard to quality:—"The quality is best. It is the best dessert Russian I have yet seen or tasted; flesh firm and juicy, with delicious pear-like flavour. I consider White Pigeon equal to Early Joe in quality—than which nothing can be better; being a hardy tree, whereas Early Joe is only half hardy, it is the best fall dessert apple for this province for home use."

JUICY NALIV (544 *Dep.*)—What I have seen of this tree and fruit, has impressed me with the belief that it will prove valuable, along northern limits of fruit-growing in Canada. Messrs. Perry, of Beaver Dam, Wis., and R. P. Speer, of Cedar Falls, Ia., both speak highly of this as a hardy fall variety. Mr. Speer classes it with those of the Hibernal type. Fruit, medium to large, handsomely coloured ; fair quality. At Ottawa the tree is a vigorous upright grower, quite hardy.

WHITE PELIKANOFF (980 *Dep.*)—This has been favourably noticed by several growers in Minnesota, on account of hardiness and almost entire freedom from blight. The fruit, as I saw it, is about the size of Duchess and better in quality, keeping into early winter.

GOLDEN WHITE (978 *Dep.*)—This has already been somewhat widely disseminated in the Province of Quebec, and last year was among the fruits distributed by the Fruit Growers' Association of Ontario. Specimens of the fruit received from Mr. R. Brodie, of St. Henri de Montréal, were large to very large, oblong ribbed and slightly irregular; colour, a rich yellow ground, covered with carmine splashings towards the stem end; calyx open, basin small, in some specimens almost absent; flesh white, crisp, tender and juicy ; sub-acid ; very good. Season, September and October. At Abbotsford, Que., it has shown some tendency to scab and crack.

ZOLOTOREFF (275 *Dep.*)—This may be classed with Titovka, 2 Dept. 430, Ribbed Naliv, 285, and Basil the Great, 971, all large coarse fall apples which seem to be intermediate between the Duchess and Alexander families. The trees are all hardy, and were among the first to fruit at Abbotsford. The Zolotoreff tree has given greatest satisfaction and is recommended for the colder districts. Described in the report for 1890.

SWITZER (304 *Dep.*)—"Has made larger full-branched trees than any other Russian. Three trees about 18 years old yielded 40 bushels for me this last season, and were very good apples; somewhat inclined to scab, but is one of the best of all the Russians where quantity is an object, and if it can be grown free from scab, as I think it can be with you. Late summer here."—A. L. Hatch, Wis.

" A fall apple, which may possibly keep as long as Fameuse under favourable circumstances. Has fruited at Como for the last four or five seasons. It is of Fameuse

type and quality. It must become a favorite dessert apple, as its appearance and excellent quality place it in the front rank. The aromatic odour of the Switzer when ripe is more powerful than any other apple I know of. The tree is a heavy bearer, but its weak point is a tendency to drop the fruit considerably some seasons. Taking it altogether, the Switzer is a great acquisition, and could no doubt be grown successfully in unfavourable localities where the Fameuse does not succeed."—R. W. Shepherd. I do not think we can rank this among the hardiest, as at Mr. Haviland's place, northern Iowa, the wood was badly coloured; also at points in Minnesota it did not exhibit the same power to resist extremes as did many others. Yet, where Wealthy succeeds, I think it can be safely planted. In regard to quality, it is not overrated by Messrs. Hatch and Shepherd.

WINTER.

OSTREKOFF (4 *m.*)—One of Prof. Budd's importation from Moscow. A perfect tree at Ottawa, giving a few specimens of fruit last year—the second from planting. The tree is doing well in Minnesota and Iowa, where it is looked upon as a decided acquisition. The fruit is medium to large, round waxy yellow, with bright blush on sunny side, flesh white, sub-acid, juicy, melting, good. Mr. Peterson, of Minn., says "keeps till March." I was very much pleased with this as seen in barrels at the Iowa Agricultural College last summer, and was impressed with the idea that it would make an attractive and saleable market apple.

OSTREKOFF (472 *Dep.*)—Is also a winter apple and a hardy tree. I have been unable to compare the fruit of these two, but Mr. Peterson, of Minnesota, can see no difference between this and Lieby, or Hibernal.

ANTONOVKA (236 *Dep.* 26 *m.*)—Although received from several sources, all appear true to name. This has proved valuable in the west, only in locations more or less free from blight. The tree is unquestionably hardy, and I have every hope of it being very serviceable at the north. Fruit medium to large, nearly round, yellow, without much colour; flesh white, breaking, briskly acid, but pleasant. I should like to see it widely tested. This will prove fall and early winter in many sections.

HIBERNAL (378 *Dep.*)—This has been fruiting for a number of years over wide areas. Two points are thoroughly established: 1. That it is one of the hardiest of all the Russian apples. 2. That it has no value as a dessert fruit, but as winter cooking apple is very useful. In the many reports which I have received, in no case has this or Lieby, which is almost identical, been omitted from the autumn or winter list. Growers in Iowa, Minnesota, Dakota, Montana, Wisconsin, Vermont and the Province of Quebec, all testify to its value for the north. In districts where Wealthy, Pewaukee and Scott's Winter succeed, there is little room for apples of this quality, except as stocks for top grafting; but for points farther north its value has become generally recognized.

LONGFIELD (161 *Dep.*)—Rather better known than the majority of the Russians, on account of its habit of bearing young and heavily. The tree is very distinctive in appearance, a poor grower in nursery, shaping itself in orchard into a conical form, with the lower branches quite drooping; leaves silvery on the lower side. The size of the fruit depends much on care and cultivation; being a tremendous annual bearer, if not well manured and thinned, the fruit soon deteriorates and becomes small. Quality is first-class. For home use this should be encouraged. Ordinarily its season is that of Fameuse, or a little later in the Province of Quebec.

RED REINETTE (316 *Dep.*)—This tree is reported by Mr. Hatch, of Wisconsin, as not being very hardy, yet it is succeeding well with Mr. Somerville of Minnesota, and Mr. Havi and, of Iowa. Hardy, at Ottawa and at various points where tried in Quebec. Fruit medium to large, round, approaching conical in form; green ground, covered on one side with a dark red blush; texture of flesh very firm, very pleasant sub-acid, a good keeper.

CROSS (413 *Dep.*)—This is a fruit of medium size, flat, sometimes ribbed; green, with light red splashes on the sunny side; calyx closed, basin irregular, wrinkled;

stem thick, set in a deep wide cavity; flesh white, mild, sub-acid; season, early winter. Tree a strong grower, perfectly hardy here and at Abbotsford. It is succeeding admirably in Minnesota and Northern Iowa.

GIPSEY (1,227 *Dep.*)—This was noted in the report of last year, and is repeated here to emphasize its value. About the season of Fameuse.

SILKEN LEAF (327 *Dep.*, 75 *m.*)—A very hardy tree, bearing large, coarse-fleshed apples, of value only for culinary purposes. As in the case of Hibernal, the planting of this should be confined exclusively to extreme northern situations. Valuable as a top-working stock.

ARABKA (257 *Dep.* Imported by Elwanger & Barry, Rochester, N.Y.)—This was also mentioned in my report for 1890, and should have a place with planters in northern Ontario. (No. 315 Dep. Herren, as fruited at Abbotsford, seems to be identical with the above.)

ROYAL TABLE (5 *m.*)—*See* report for 1890.

ZUSOFF (585 *Dep.*)—Prof. Budd reports this not quite hardy at Ames, but Messrs. Somerville and Harris, of Minnesota, pronounce it satisfactory, and Mr. Tuttle, of Wisconsin, gives it three stars, and says it is equal to Fameuse in quality. It is certainly one of the handsomest large winter apples I have seen. I cannot speak of its hardiness at Ottawa, as it was only added to the collection last year. I feel jutisfied in saying, however, that where the Fameuse is hardy it can be safely planted. Fruit large, round and symmetrical, almost entirely covered with a rich dark red colour; flesh coarse, but not as stringy as Alexander; a pleasant acid. Season, mid-winter.

PLUMS.

A number of varieties of the *Prunus Americana* type (the De Sota class) fruited the past season, although planted only the previous year. While these cannot compete with the finer varieties of *P. Domestica* as shipping and market fruits, yet they will, in the north, fill a very important place for home use, being excellent for canning and preserving. Some of them, for example, Forest Garden, Wyant and Yosemite Purple, need annual shortening-in to keep the branches from becoming too long and unmanageable. Another important point towards attaining the best results with this class is the mixing of varieties in the orchard, for the purpose of more complete fertilization. Some kinds, Speer and Miner, for example, are said to be imperfect self-fertilizers and need a supply of pollen from other varieties in order to perfect their fruit. Very few belonging to the class *P. Domestica* came through the winter without greater or less injury, the condition of varieties in a general way corresponding with statements made in the report for 1890.

PEARS.

The varieties of Russian pears noted in last year's report have grown very vigorously the past year, and their dark-green glossy foliage has attracted the attention of many visitors while looking over the farm.

The question of hardiness seems to be, in the case of a large number of varieties, quite assured, but I do not anticipate that the fruit in any case will approach in quality Bartlett, or even Flemish Beauty. *Bessemianka* and *Gakovka* gave again this year a few specimens of fruit; in size medium to small, below medium in quality, showing too much tendency to drop prematurely and also to decay at the core—even before falling—without being apparently ripe. This, especially, was the case with *Bessemianka*. Dr. Hoskins, of Vermont, however speaks very favourably of the quality of this variety as fruited on his grounds. As it has been imported from several points in Russia, it is quite probable that variations will be found to exist, and time is needed to bring out the best.

Cherries.

An abundant show of blossoms presaged a heavy crop of cherries, but a severe frost followed by cold winds prevented fertilization, so that many varieties new to this locality did not fruit at Ottawa as was expected. At Abbotsford, however, the crop was only partially destroyed and an opportunity of summing up and comparing the notes of previous years was enjoyed. These results and conclusions, together with cuts of promising varieties, are embodied in a bulletin now in course of preparation.

The varieties under trial in this division of large fruits seem destined to be of great service in extending the profitable cultivation of cherries considerably northward. In order to accomplish this object successfully one or two important points must be remembered: 1. They must be headed low and trained somewhat in bush form; 2. Plant deeply in well-drained soil, and throw a mound of earth about the base of the tree in the fall to protect the roots.

II.—SMALL FRUITS.

Grapes.

In the older grape-growing districts, the crop of the past year was an abundant one. In the Ottawa valley, which has quite a local reputation for the excellence of this fruit, the season was not favourable. Unusually warm weather in early spring induced growers to uncover their vines earlier than usual; cold, frosty weather following resulted in the killing of the unfolding buds and destroying the possibility of the year's crop of fruit. Those who waited till warm weather was assured, were rewarded by a full crop, although the unusually cool weather during June, July and August retarded ripening very much, yet the abnormally hot September more than counterbalanced the low temperature of early summer, and a much larger proportion of the varieties fruiting, ripened this year than last, though nearly ten days late on the whole. On the night of 14th of August a hail storm, local in extent, but very severe while it lasted, passed over the farm, doing much damage to vines and tender plants. It was estimated that 25 per cent of the fruit was lost from this cause. The leaves, where exposed, were completely riddled and the berries split open. Varieties trained to trellises suffered more than those on single stakes. Mildew under the control of ammoniacal copper carbonate did not appear in the farm vineyard to any appreciable extent, but anthracnose "Bird's-eye rot" (*sphaceloma ampelinum*) attacked a few varieties very persistently, and did not yield to the above remedy. This disease attacks the wood as well as the fruit, giving the former a blotched and spotted appearance, not unlike raspberry cane anthracnose. Some experimenters have obtained best results from the use of a strong solution of copper sulphate and in some cases iron sulphate (1 lb. to 10 of water) with which the canes are washed before tying to the trellis in the spring, followed by the application of Bordeaux mixture. The danger of vines being killed in winter when planted in light soils in exposed positions, and without a heavy protecting mantle of snow, has been strongly impressed upon me the past season, when noting the numerous fatalities resulting from the planting of vines in such situations, without taking proper precautions. Where the winter cold is extreme, it is necessary not only to cover with earth, but also to provide for a liberal covering of snow by placing wind-breaks of boards at intervals, or ever-green boughs to collect and hold the snow. This care is most essential when the vine is young and not fully established.

The following tabular statement shows the dates of colouring, ripening and gathering of each variety, fruited the past season, given in order of maturity:

Black Grapes.

Name.	Date of Colouring.	Date of Ripening.	Date of Gathering.
Florence	September 4	September 9	September 18.
Champion	do 4	do 15	do 23.
Moore's Early	do 4	do 18	do 30.
Janesville	do 4	do 18	October 1.
Canada	do 8	do 18	do 5.
Early Victor	do 14	do 20	September 30.
Eumelan	do 14	do 21	October 7.
Telegraph	do 4	do 21	do 3.
Cottage	do 14	do 22	September 30.
Potter	do 6	do 24	October 1.
Rogers No. 17	do 12	do 25	September 30.
do 36	do 12	do 25	do 30.
Brant	do 14	do 25	October 5.
Worden		do 25	
Eaton	September 14	do 26	do 1.
Black Elvira	do 14	do 26	do 1.
Peabody	do 9	do 26	do 1.
Herbert	do 20	do 26	do 2.
Merrimac	do 8	do 26	do 5.
Barry	do 15	do 26	do 5.
Conqueror	do 14	do 26	do 2.
Montefiore	do 21	do 26	do 5.
Creveling	do 14	do 26	do 5.
Wilder	do 14	do 26	September 30.
Chase Bros. (New)	do 18	do 26	October 2.
Belvidere	do 12	do 28	do 2.
Ives	do 18	do 28	do 2.
Monroe	do 14	do 30	September 30.
Amber Queen	do 18	do 30	do 30.
Hartford	do 18	do 30	October 1.
Elsinburg	do 24	do 30	do 7.
Alma	do 20	October 1	do 7.
Burnet	do 20	do 1	do 2.
Secretary	do 20	do 1	do 3.
August Giant	do 20	do 2	do 2.
Bacchus	do 22	do 5	do 7.
Cambridge	do 16	do 5	do 5.
Concord	do 24	do 5	do 5.
Canada Arnold	do 14	do 5	do 10.
Norton's Virginia	do 22	do 5	do 6.
Alvey		do 7	
Pizzaro	September 21	do 7	do 7.
Clevener	do 21	do 7	do 7.
Marion	do 4	do 7	do 7.
Rogers No. 2	do 24	do 10	Oct. 7 partly ripe.
Naomi	do 24	do 10	do 10.
Cunningham	do 25		do 12 not ripe.
Ariadne	do 20		do 12 do
Isabella	do 26		do 12 do
Othello	October 1		do 12 do
Senasqua	September 26		do 12 partly ripe

Red Grapes.

Name.	Date of Colouring.	Date of Ripening.	Date of Gathering.
Delaware	September 5	September 16	October 1
Moyer	do 8	do 17	do 1
Dracut Amber	do 16	do 25	do 1
Mary	do 6	do 25	do 1
Northern Muscadine	do 14	do 25	do 3
Rogers No. 30	do 11	do 25	do 3
Gaertner	do 14	do 26	do 2
Poughkeepsie	do 12	do 26	do 2
Brighton	do 12	do 26	do 2
Rogers No. 13	do 12	do 28	do 3
Lindley	do 14	do 30	do 1
Rogers No. 24	do 20	do 30	do 1
Maxatawney	do 14	do 30	do 1
Owasso	do 16	do 30	do 1
Salem	do 9	October 1	do 3
Massasoit	do 16	do 1	do 1
Norwood	do 18	do 1	do 2
Victoria	do 21	do 1	do 2
Berckmans	do 24	do 3	do 7
Rogers No. 5	do 16	do 5	do 5
Woodruff	do 16	do 5	do 7
Agawam	do 16	do 5	do 5
Rogers No. 39	do 22	do 6	do 10
Jefferson	do 21	do 6	do 10
Requa, Rogers No. 28	do 26	do 6	do 6
Vergennes	do 20	do 6	do 6
Oriental	do 24	do 10	do 10
Highland	do 24		Oct. 7, not ripe
Diana	do 24		do 10, do
Ulster Prolific	do 24	October 10	do 10, partly ripe
Catawba	do 21	do 10	do 10, do
Beauty	do 25		do 12, not ripe
Rogers No. 32	do 20		do 10, do
Challenge	do 25		do 10, partly ripe
Iona	do 30		do 10, do

White Grapes.

Name.	Date of changing Colour.	Date of Ripening.	Date of Gathering.
Hayes	September 15	September 24	October 2
El Dorado	do 8	do 24	September 30
Lady	do 8	do 25	October 1
Jessica	do 4	do 25	do 3
Empire State	do 12	do 25	do 3
Roger's No. 34	do 20	do 25	September 30
Allen's Hybrid	do 18	do 26	October 3
Duchess	do 18	do 26	do 6
Moore's Diamond	do 19	do 27	do 2
Perkins	do 18	do 28	do 4
Kensington	do 20	do 28	do 4
Niagara	do 15	do 30	do 4
Grein's No. 7	do 18	do 30	do 1
Irving	do 20	October 1	do 4
Elvira	do 22	do 4	do 7
Martha	do 15	do 5	do 5
Wilding	....	do 5	
Lady Washington	....	do 7	
Prentiss	September 20	do 7	do 10
Grein's Golden	do 19	do 10	do 5
Pocklington	do 21	do 10	do 10
Amber	do 21	do 10	do 10
Taylor	do 21	do 10	do 10
Noah	do 20	do 10	do 5
Triumph	October 1	....	Oct. 10, not ripe
Transparent	....	....	do 10, do
Etta	....	....	do 10, do
Imperial	September 30	....	do 10, do
Eva	....	....	do 10, do
Pearl	....	....	do 12, do
Autuchon	....	....	do 5, do
Missouri Reisling	September 21	....	

NOTES OF VARIETIES.

In considering the following opinions, it must be borne in mind that of all edible fruited plants, grape vines are among the most variable as to constitution of vine, quality, and quantity of fruit. Slight differences in soil and exposure often cause great variability in the nature of the product. In the main, the information given is based on the behaviour of each variety on the grounds of the Central Experimental Farm, supplemented in some instances by outside observation and experience.

I am indebted to the excellent Grape Manual published by Messrs. Bush & Son & Meissner, of Bushberg, Mo., U.S., for the nomenclature and origin of many of the varieties mentioned. To elucidate future reference, it may be well to say that all our cultivated grape vines east of the Rocky Mountains are derived from a few wild species, by crossing or hybridization between our natives, or with representatives of the European species, *Vitis Vinifera.*

1. VITIS LABRUSCA or Northern Fox Grape, native of the south New England and middle States. The *Rogers'* varieties are largely derived from this source.

2. VITIS RIPARIA is what is known in northern sections as the Frost Grape; distributed throughout Canada and the north-western States. *Clinton*, *Brant* and *Bacchus* are prominent examples of this class.

3. VITIS AESTIVAEIS; the wine grape of the middle or southern States; very few varieties of this species ripen as far north as any portion of Canada.

4. VITIS VINIFERA; European or old-world species. Hybrids have been produced between this and a number of our natives, with many failures and some successes.

BLACK VARIETIES.

AMBER QUEEN (*Labrusca?*).—A hybrid introduced by Ellwanger & Barry, sometimes classed with red grapes. Bunch medium to large; berries large oval; amber at first, turning black when fully ripe; good quality; usually three or four days earlier than Concord; keeps well. This is not the Amber Queen grown by a number of amateurs, proprietors of city gardens in Ottawa. This is a pure amber-coloured grape.

ALMA (*Riparia.*)—This was erroneously described as a white grape in the report of 1890. I should have said small black, of the Clinton type. May be of value in districts south of this as a wine grape.

AUGUST GIANT (*Hybrid.*)—A cross between Black Hamburg and Marion, retaining the characteristics of bunch and berry of the former. Does not attain full perfection of maturity here, although it colours well. Vine a rampant grower, but subject to winter killing. As an amateur variety for points south of this it is to be commended.

ALVEY (*Aestivalis.*)—Originated in Maryland. Vine a short-jointed slow grower Bunch medium, berries small, not promising.

ARIADNE (*Riparia.*)—Seedling of Clinton. Bunch and berry small, black, and with present experience, apparently worthless.

BRANT (*Riparia hybr.*)—A seedling of the Riparia type, produced from Clinton seed. Bunch long narrow shouldered; berry small, with purple bloom. Flavour a sprightly vinous acid, much liked by some. Vine a rampant grower and heavy bearer, but the foliage is frequently injured by powdery mildew. It makes wine of a high quality; ripening early, it is probably the most valuable of Mr. Arnold's seedlings for northern sections.

BARRY (*Rogers No.* 43.)—Vine, like most of the Rogers varieties, a strong grower. but on these grounds has the defect of dropping its leaves before the fruit matures. Bunch medium to large, shouldered, compact; berry large round, covered with bloom. Mildewed slightly the past two years. Keeps till the middle of December, as ripened here.

BELVIDERE (*Labrusca.*)—Vine closely resembles Moore's Early. Bunch medium to small; berry small, fair quality. Further trial is needed before an opinion can be offered.

BURNET (*Hybrid.*)—A cross between Hartford Prolific and Black Hamburg produced by P. C. Dempsey, of Prince Edward Co., Ont. Vine a fair grower; bunch large; berry medium; size oval; reddish black in colour; fine quality, but does not ripen sufficiently early for our average seasons; a poor keeper; desirable for home use.

BACCHUS (*Riparia.*)—Like its parent, the Clinton, in many respects very productive, but the vine is not so vigorous. Bunch and berry small, ripening unevenly; sharp acid. Too late and uncertain for this locality or points northward.

CHAMPION (*Labrusca.*)—The hardiness, productiveness, and early ripening habits of this grape have given it popularity in sections where it should be replaced by varieties of better quality, as it is a question whether the cultivation of such varieties trends to develop grape-growing or not. In the colder sections it has much value.

CANADA (*Riparia hybi.*)—A seedling of Clinton, crossed with one of the European grapes, produced by the late Charles Arnold, of Paris, Ont. Bunch medium, berry small, round, with a pleasant acid sprigthtliness of flavour. It ripens among the earliest; keeps only a short time. Recommended for gardens at the north.

COTTAGE (*Labrusca.*)—This was given to the public by Mr. W. E. Bull, of Massachusetts, who originated the Concord, of which the Cottage is a seedling, and to which its foliage bears a striking resemblance. Bunch medium to large, berries larger than Concord, perfectly round; not equal to Concord in quality. In this locality the berries separate from the bunch immediately it ripens; but in this condition kept last year into November.

CONQUERER (*Labrusca?*)—Parentage obscure. Vine a strong grower. Bunch long, loose; berry medium size; with the summer heat of Ottawa it does not become sweet enough to be palatable.

Creveling (*Labrusca.*)—Does not attain perfection in this vicinity. Vine a fair grower; bunch loose; berries oval, good quality. Subject to mildew and anthracnose. A vine surrounded by Clintons has set better bunches and borne larger crops than others of the same variety in the vineyard, showing the advantage of foreign pollen towards attaining the best results.

Chase Bros' Seedling.—Fruit and vine of the Concord type. No apparent improvement.

Cambridge (*Labrusca.*)—Closely resembling Concord. No improvement.

Clevener.—No record of the origin of this variety. A small black wine grape without special value.

Cunningham (*Aestivalis*).—Quite too late for this locality; in fact it is doubtful whether it will ripen in any part of Canada. Essentially a southern grape.

Early Victor (*Labrusca.*)—Originated with John Burr, of Leavenworth, Kans., nearly twenty years ago. It belongs to the Labrusca division; a strong grower and a heavy bearer. Bunch above medium size, very compact; berry medium, round, with purplish bloom. Like Florence as grown here, it is particularly perishable, the berries shrivelling and dropping within a few days of gathering. Ripened last year 16th September, this year 20th September. In other grape-growing districts it is often spoken of as a fair keeper and shipper.

Eumelan (*Aestivalis.*)—Supposed to be a variation of the wild grape (*Vitis Aestivalis*) of Texas and Arkansas, and the earliest variety from this stock. Bunch medium size, well shouldered; berries medium; skin thin, pulp fairly tender; ripening with Early Victor; keeps with care up to 1st January. The vine is a short-jointed slow grower.

Eaton (*Labrusca.*)—From Concord seed; fruited for the first time on these grounds this year. A very large bunch and berry. Berries larger than any of the Black Roger hybrids, rather pulpy. Ripens a few days earlier than Concord.

Elsinburg, of *Vitis Aestivalis* extraction.—Vine a weak grower, with small deeply cut leaves. Fruited this year only: bunch and berry small, the latter quite seedy. Not promising.

Florence (*Labrusca*) ?—Said to be of Labrusca parentage. Vine a short-jointed, slow grower; leaves small; very pubescent. Bunch and berry medium to small, ripening with or before Champion. This year it matured nearly a week ahead of any other variety in the vineyard. Quality only medium. The fruit is very perishable, shrivelling on the vine soon after maturing. As a grape for garden culture in the colder sections it is valuable. Not a market variety in any respect.

Herbert (*Hybr.*) (*Rogers* 44.)—The product of a cross between Black Hamburg and *Vitis Labrusca.* Vine a strong grower, occasionally subject to mildew. Bunch and berry among the largest, very handsome and quality good. Keeps easily to the middle of January. Where this variety succeeds, it is one of the most profitable of the Roger hybrids.

Hartford Prolific (*Labrusca*).—An old and well known variety, especially in the eastern States, where it originated about thirty years ago. In this vicinity it cannot be taken as a standard of earliness, as this year it barely ripened before frost. In quality better than Champion, but too poor to encourage where finer grapes ripen.

Ives (*Labrusca*).—Vine vigorous and healthy. Bunch medium to large; berry approaching oval in form. Although it colours well, it does not thoroughly mature here. Farther south it may have value as a wine grape, for which purpose it was first introduced.

Isabella (*Labrusca*).—One of the oldest representatives of the native American grape. Its place has been taken by more profitable varieties in most grape-growing districts. Does not mature here.

Janesville (*Labrusca*).—Origin obscure. Of Labrusca parentage. Bunch and berry small; juicy, pleasant, but pulp is generally tough and objectionable. Ripening as it does with Champion, for home use I think it preferable, but as a market variety and in point of productiveness it does not compete with the former.

MOORE'S EARLY (*Labrusca*).—A seedling of Concord. Much resembles its parent, with a larger berry and smaller bunch. Quality equal to Concord. Vine rather a slow grower; needs careful cultivation and liberal manuring. For home use and market it should have a place in every collection.

MERRIMAC (*Rogers No.* 19).—Vine an exceptionally free grower, usually healthy and exempt from mildew; bunch medium size, roundish, and compact. In bunch and berry closely resembling Barry and Wilder. Slightly sweeter however, and ripening more evenly, it is on the whole preferable. Keeps well.

MONTEFIORE (*Hybrid*).—Vine weakly, subject to mildew. Resembles Early Victor in size of bunch and berry. As a red wine grape, its merits have been strongly advocated farther south, and for such purpose it may be valuable in localities where it ripens to perfection.

MONROE (*Labrusca*).—A cross between Delaware and Concord by Ellwanger and Barry, of Rochester, N.Y. Medium sized bunch and berry; poor quality; not desirable.

MARION (*Riparia*).—A southern wine grape of considerable repute. Although it colours early, yet it is one of the last to ripen, and does not attain here the requisite sweetness to make wine of the best quality. Vine hardy, vigorous and productive; somewhat liable to mildew.

NORTON OR NORTON'S VIRGINIA (*Vitis Aestivalis*).—One of the leading wine grapes of the South Central States. Bunch small; berry medium; very sour as fruited here, the summer heat being insufficient to bring it to perfection.

NAOMI (*Riparia hybr.*)—Of Clinton parentage with a mixture of foreign blood. Vine vigorous, productive; bunch large, shouldered; berry small; quality very good, with a peculiar sugary suggestion. I am inclined to think favourably of this as an amateur variety where it will ripen. Uncertain in this vicinity.

OTHELLO (Arnold's Hybrid, No. 1.) (*Riparia hybrid.*)—Vine vigorous, and productive. Does not ripen here. One of the most popular of our American grapes in France, for making wine.

POTTER (*Labrusca?*)—Bunch compact, medium size, not shouldered; berry large; altogether resembling Cottage quite closely; skin thick, and pulp rather tough. Ripened last year with Champion, this year about one week later; much better quality.

PEABODY (*Riparia*).—A seedling of Clinton, raised by Mr. Ricketts, of New York State. Bunch and berry medium size, the latter oval with blue bloom; seeds large; berry juicy, acid, with a peculiar breaking quality of flesh. Matures about a week later than Moore's Early; vine a fair grower.

PIZZARO (*Riparia hybrid*).—A cross between Clinton and a foreign variety. Bunch and berry small black; late; not desirable.

ROGERS No. 17 (*Hybrid*).—Much resembling Herbert, No. 44, and apparently no improvement.

ROGERS No. 36 (*Hybrid*).—Same season as last; not quite as large as Herbert. Vine a strong grower, free from mildew.

ROGERS No. 2 (*Hybrid*).—Vine a strong grower; subject to leaf mildew. Bunch large; berry very large, oval; sharp acid. Too late for this and similar latitudes.

SECRETARY (*Riparia hybrid*).—A cross by Mr. Ricketts between Clinton and a foreign variety. It retains the Clinton foliage and style of bunch. Mildews badly; nothing to commend it for this locality.

SENASQUA (*Labrusca hybrid*).—A hybrid between Concord and Black Prince; a foreign variety. Vine a fair grower but not hardy. Bunch of large size, very compact, shouldered; berries medium; too late to obtain an idea of quality as fruited here. Am inclined to think favourably of it for southern Ontario.

TELEGRAPH.—Of the Labrusca or Southern Fox grape type, coming according to the Bushberg catalogue from Pennsylvania. Bunch medium, very compact; berry purplish black, oval; sweet, with slightly foxy flavour. I am inclined to think favourably of it.

Worden (*Labrusca*).—A seedling of Concord; for this climate much more desirable, on account of maturing a week or ten days earlier, and being of better quality. As a shipping grape it does not come up to the standard of Concord, being thinner in skin and more tender generally. Vine hardy and vigorous. Owing to the great demand for this variety when first given to the public, many vines not true to name were sold, resulting in great disappointment to purchasers as the reputed Wordens frequently developed into good old-fashioned Concords. This was our experience with four out of six vines of this variety planted in the experimental vineyard.

RED VARIETIES.

Agawam (*Rogers No.* 15).—Vine a strong free growth, inclined to mildew; bears profusely. Bunch and berry large; colour, dark crimson; very rich; juicy; of first quality. Skin thick; keeps well without losing its flavour. In this section it does not ripen to perfection every season.

Aminia (*Rogers No.* 39).—Resembles the last so closely as to render a description unnecessary. In flavour and keeping qualities not equal. Vine fairly vigorous.

Brighton (*Labr. hybrid*)—A cross between Concord and Diana Hamburg. A strong, free grower; very productive; fairly free from mildew. Bunch large; well shouldered; berry medium; colour, dark crimson; pulp melting; juice very sweet; equal to Delaware in quality. Unless perfectly ripened does not keep well, losing flavour in three or four weeks. Too tender for distant shipment; where it ripens, invaluable for home use. Matured comparatively earlier this year than last.

Berckman's (*Riparia hybrid*).—Resembles Clinton, one of its parents, in form of bunch, and Delaware, the other parent, in flavour—not quite so sweet however. Ripened last year a few days after Delaware, but was much later this season. I am inclined to think well of it.

Beauty (*Labrusca*).—Said to have originated in Minnesota from Delaware, which it resembles. Bunch, medium, compact; berry round, medium size; the colour of Salem, with a purplish tinge; pulpy; poor quality.

Catawba (*Labrusca*).—One of the oldest and most widely known grapes in cultivation, being a selection from the native *vitis Labrusca*, of North Carolina, introduced nearly seventy years ago. Valuable as a market grape where it ripens and is free from mildew; much too late for this vicinity.

Challenge (*Labrusca hybrid*).—Said to have originated from Concord seed, fertilized with a foreign variety. Bunch large; berry medium fair quality; ripens very unevenly, and late.

Delaware (*Vinifera hybrid*).—The origin of this widely disseminated variety is unknown. Vine a slow grower, never attaining very large size; hence particularly valuable for garden culture. Bunch medium; berry small, very sweet and juicy; quality best. In the Mississippi valley, where this does not succeed on its own roots, it has been grown satisfactorily grafted on Concord roots. One of the most valuable for this latitude.

Dracut Amber (*Labrusca*).—Is simply a variation of the Southern Fox grape, maturing exceptionally early. Vine vigorous; bunch large; berries large, round and thick-skinned; a poor keeper, with such a strong foxy odour as to be very objectionable to most people; hardly worthy of propagation.

Diana (*Labrusca*).—Vine succeeds well, but its fruit does not ripen here.

Gaertner (*Rogers No.* 14).—A very strong grower, with healthy foliage. Bunch medium; berry large, light amber; attractive; good quality; when kept, developes a slight foxiness. Ripening as it does soon after Delaware, considering quality and productiveness, it will generally give satisfaction.

Highland (*Labrusca hybrid*).—Produced from Concord fertilized with a foreign variety, by Mr. Ricketts, of New York. Vine a weak grower; bunch long; berry medium size, and of bright, attractive colour; skin thick; very juicy; acid as grown here, where it does not thoroughly mature; a variety well worth testing south of this.

Iona (*Labrusca*).—A seedling of Catawba; a fair grower, bearing fruit of first quality; is subject to mildew; ripens with Catawba; too late for this locality.

Jefferson (*Labrusca*).—A cross between Concord and Iona, by Mr. Ricketts, of New York. Vine a strong grower, of the Concord type; affected with anthracnose the past season. Bunch large; berry medium size, bright red, thick skinned; in quality very rich and juicy. In keeping it shrivels, but retains its flavour; as a market grape, where there is a longer ripening season than at Ottawa, it should be more generally planted.

Lindley (*Rogers No.* 9).—Without doubt one of the most valuable and generally adaptable of Rogers' hybrids. Vine a healthy, free grower. Bunch long, loose, occasionally so, from imperfect fertilization; berry medium to large, juicy and rich; keeps without extra care till the first of January.

Moyer. ——— The proprietor of this grape, Mr. E. D. Smith, of Winona, says, that it originated with Mr. Allan Moyer in Lincoln County, Ontario, about ten years ago. As fruited here this year it seems almost an exact counterpart of Delaware; the berry slightly larger; bunch generally smaller; quality is good; worthy of trial.

Mary (*Labrusca*).—Introduced by Jacob Rommel, of Missouri. Vine a free, healthy grower, with Roger-like foliage; productive; bunch large, shouldered; berries medium to large; light amber; skin thick; juicy, sweet; quality, fair to good; keeps to 1st January; very promising.

Maxatawney (*Labrusca*).—Bunch small; berry medium size; amber coloured; quite foxy; poor quality; shrivels soon after picking; further trial is needed; not promising.

Massasoit (*Rogers No.* 3.)—A fair grower; ripening with Salem. Bunch larger, berry smaller; light red; good quality; much subject to mildew; preferred by many to Salem or Agawam; keeps well into December or January.

Northern Muscadine (*Labrusca.*)—Another very foxy kind, closely resembling in that respect Dracut Amber. Bunch and berry medium size; dull amber colour; fairly productive. For those who admire the decidedly foxy characteristics, it is worth planting.

Norwood (*Labrusca.*)—In growth and appearance resembles Lindley. Bunch large, shouldered; berry large; bright amber; thick skinned; very productive; keeps well; ripened 1890 with Delaware; this year, 1891, nearly two weeks later. Very desirable.

Owasso (*Labrusca.*)—Strong grower; productive foliage, and fruit apt to mildew. Bunch large, long and loose; imperfectly fertilized. Berry dark amber, mottled; poor keeper; hardly to be commended.

Poughkeepsie.—From Iona and Delaware seed; vine a weak grower; entirely lacking vigour on these grounds. Bunch and berry larger than Delaware; not equal in quality but fairly good. Does not keep well; should be tested in a limited way.

Rogers No. 30 (*Hybrid.*)—Vine vigorous, productive. Bunch large. Berry very large, rich and juicy; rather irregular as to date of ripening; last year it matured after Lindley; this year four or five days ahead; a valuable variety.

Rogers No. 13 (*Hybrid.*)—Vine a moderate grower. Bunch and berry large dark amber, good quality; resembles Vergennes quite closely, but is not preferable, as it is not a good keeper.

Rogers No. 24 (*Hybrid.*)—A fairly satisfactory vine, but resembling Agawam too closely to warrant propagation.

Rogers No. 5 (*Hybrid.*)—Vines have made a poor growth and borne lightly. In season, quality, and appearance resembling Lindley.

Requa (*Rogers No.* 28).—Vine weakly; bunch medium to large; berry large, oval, dark amber; highly flavoured; too late for this vicinity.

Rogers No. 32 (*Hybrid*).—Vine vigorous and productive but lacking in foliage, which retards and prevents perfect ripening. Bunch large; berry large, oval, amber-coloured, juicy; a fair estimate of quality could not be obtained.

Salem (*Rogers No.* 53).—Bunch medium. Berry large, dark chestnut ; skin thick; juicy, and pulp rich and of first quality. Subject to mildew of vine, which injures the keeping qualities of the fruit. One of the best of the Roger's hybrids where not affected by mildew.

Ulster Prolific (*Labrusca*).—Vine has not made a satisfactory growth. Of half a dozen planted in different situations all are feeble and making weak growth. Bunch short, shouldered; berry medium; bright amber; flavour not rich, but very sweet and pleasant. Where the plant succeeds it may ripen its fruit earlier than as noted elsewhere in the table.

Victoria (*Labrusca*).—Vine lacking vigour and hardiness; bunch loose, medium size; berry oval; dark amber; skin thick, acid; not reliable for this locality.

Vergennes (*Labrusca*).—Originated in Vermont; vine exceedingly hardy and vigorous. Bunch and berry large; skin thick; flavour rich and sprightly, which characteristic is well retained even when the fruit is kept under ordinary circumstances. As a winter grape it probably heads the list.

Woodruff (*Labrusca*).—Said to be a cross between Concord and Catawba; vine vigorous, short-jointed, with thick leathery leaves; bunch medium; berry large, round, light red; foxiness distinctly noticeable; quality fair; cannot be considered good; does not keep well.

WHITE VARIETIES.

Allen's Hybrid (*Vinifera hybrid*).—Is of interest as being the first American hybrid grape, produced nearly forty years ago. Vine a weak grower; bunch medium. Berry small; golden yellow; fine quality; home use.

Amber (*Riparia*).—Originated in Missouri; of the same stock as Elvira; vine a good grower; bunch and berry medium size; the former rather long and loose. A correct estimate of quality can hardly be arrived at as ripened here.

Autuchon (*Riparia hybrid*).—Mr. Arnold, of Paris, Ont., produced this by crossing a seeding of Clinton with Golden Chasselas. A weakly vine, bearing a small white grape; ripening very late; of no value here.

Duchess (*Labrusca hybrid*).—Supposed to be of Concord and Delaware extraction. Vine exceedingly vigorous and productive; bunch medium; very compact. Berry medium size; greenish white; clings well to cluster; flesh tender, with a peculiar breaking quality, and brisk vinous flavour. Because of its firm texture it should prove a desirable market variety. This grape was shown in good condition by Ellwanger & Barry, of Rochester, at the meeting of the Western New York Horticultural Society, 28th January, 1892.

El Dorada (*Labrusca hybrid*).—Produced by Mr. Ricketts, by crossing Concord with Allen's hybrid. Vine vigorous, hardy, fairly productive, but does not always set its fruit well; bunch long, loose. Berry medium to large; when fully ripened, a beautiful golden yellow. The flavour and quality are richer and finer than anything in the vineyard. Too tender for shipment, but should have a place in the garden of every amateur.

Empire State (*Riparia*).—A cross between Hartford Prolific and Clinton, by Mr. Ricketts, of New York, who sold the vine and right of sale, to a Rochester nurseryman for $4,000. It has not fruited in sufficient quantity in this vineyard thus far to describe it accurately. Appears to be somewhat later than Delaware.

Elvira (*Riparia*).—Vine hardy and a strong grower; bunch of medium size; compact. Berry medium, round, green; when well ripened tender, with a fine rich flavour. Judge Mosgrove, the proprietor of a vineyard of considerable size on the Richmond road, finds this a profitable variety, and experiences no difficulty in ripening it. On these grounds it has not reached perfection during any season of its fruitage thus far.

Etta (*Riparia*).—Said to be a seedling of Elvira. Vine a strong grower; very productive. Bunch small; berry medium to large, round, good quality. About a week later than Elvira. Worthy of trial where the season is long enough to ripen it.

Eva (*Labrusca*).—A seedling of Concord, closely resembling Martha; a little later but not superior in any respect.

Irving (*Hybrid?*)—A single vine fruited this year for the first time in the Farm vineyard. Bunch medium; berry large, pinkish white; pulp tender.

Grein's Golden (*parentage?*)—Vine fairly vigorous; productive. Bunch large, loose, somewhat defective. Berry large, greenish white; thin skinned; pulp tender, juicy, pleasant, but not high flavoured subject to mildew. Valuable for home use where it succeeds.

Hayes (*Labrusca*).—A seedling of Concord, originating with Moore's Early. Vine; a weak grower; bunch and berry small, of a rich yellow colour; flesh tender, melting; very good; keeps with ordinary care about a month. For home use only. It should be planted particularly in localities where the summer heat is comparatively limited.

Imperial.—Said to be a seedling of the last, with an admixture of foreign blood, which is quite perceptible in the character of fruit. Bunch and berry medium to large; white, with a pinkish or lilac-coloured bloom; rich and juicy, with the aroma of hot-house grapes. Subject to mildew; it does not ripen to perfection here.

Jessica (*Vinifera*).—Introduced by D. W. Beadle, of St. Catharines, Ont. Vine fairly vigorous. Bunch and berry small; colour, golden yellow; thin skin; pulp tender; good quality; home use in northern sections.

Kensington (*Riparia hybrid*).—Produced at London, Ont., some years ago, by Mr. Wm. Saunders, who pollenized Clinton with Buckland's Sweetwater. This variety, in a remarkable way, combines in fruit and vine the characteristics of both parents. Vine fairly vigorous; wood short-jointed; leaves deeply cut; bunch medium. Berry medium size, oval; white skin, thin; pulp rich and juicy; a grape of first quality, ripening with or a little before Concord; home use. Thus far it has not been propagated to any extent, but its probable value for southern localities, should lead to giving it a more thorough trial by grape-growers.

Lady (*Labrusca*).—A seedling of Concord; vine is lacking in vigour; bunch small. Berry large, round; very agreeable flavour, with slight foxiness. For home use it is heartily recommended on account of earliness and quality.

Lady Washington (*Labrusca hybrid*).—Produced by pollenizing Concord with Allen's hybrid. Vine vigorous, partaking of the character of the female parent; bunch and berry large; pulp rather tough; fair quality. It may be serviceable in southern Ontario. Too late for this vicinity.

Moore's Diamond (*Labrusca*).—Said to be a cross between Iona and Concord. Vine a fair to medium, sometimes weak grower; bunch medium. Berry medium size, golden yellow; flesh tender and melting; good quality; does not keep well; probably too tender for distant shipment. Being earlier than Niagara, it has more value in the colder districts.

Martha (*Labrusca*).—A seedling of Concord; vine of the Concord type, but slower in growth; bunch medium. Berries small, green, pulpy, often uneven in size, foxy, medium quality; season of Concord; not a sure crop here.

Missouri Reisling (*Riparia*).—A seedling by Mr. Grein from Taylor; a white grape, quite too late for most points in Canada.

Niagara (*Labrusca*).—Said to be a cross between Concord and Cassady. Vine a vigorous and strong grower; hardy, productive. Bunch large, shouldered; berry large, round, pale yellow, as ripened in the Niagara and eastern districts. Good quality, with a well-marked foxy odour. It is subject to mildew here, and ripens only in favourable seasons.

Noah (*Riparia*).—A seedling of Taylor. Vine makes a strong annual growth. Like all seedlings of Taylor. in this vicinity it mildews badly and is too late.

Prentiss (*Labrusca*).—A seedling of Isabella. Vine a good grower; bunch compact and large. Berry medium size; flavour pleasant, though somewhat foxy; not of high quality. In some districts it is considered a good market variety. Too late in this vicinity for that purpose.

Pocklington (*Labrusca*).—A seedling of Concord. One of the most vigorous and hardy of vines. Bunch large; berry large; fair quality, with a distinct foxiness. As it carries well, it is a promising market sort where it ripens. Too late for northern Canada.

PERKINS (*Labrusca*).—Vine lacking in vigour; fruit drops badly. Bunch medium. Berry small to medium; colour greenish white, turning to pale lilac, tinged with red; flesh juicy, with considerable foxiness; has no merits as a keeper. Shrivels and losses flavour rapidly.

PEARL (*Riparia*).—A seedling of Taylor; very late, and utterly worthless on account of its liability to mildew.

ROGERS No. 34 (*Hybrid*).—Vine vigorous and productive; bunch long loose. Berry large, light yellow; skin thin; flesh tender, rich and melting; first quality. Like a number of the Rogers varieties, it is not a perfect self-fertilizer, and should not be planted in an isolated position. Valuable for home use.

TAYLOR (*Riparia*).—An old Kentuckian variety brought into notice many years ago. Vine makes satisfactory growth, but is badly affected with powdery mildew; bunch and berry small; poor quality; not adapted to our soil and climatic conditions.

TRIUMPH (*Labrusca hybrid*).—A cross between Concord and a foreign variety, by Campbell, of Ohio. Vine not hardy here. Fruit attractive, on account of size and appearance, but its value in Canada is quite doubtful.

TRANSPARENT (*Riparia*).—A seedling of Taylor. Vine vigorous; very productive; bunch small, very compact; berry very small, unattractive. As a wine grape it is worthy of a trial in sections to the south of this.

WILDING (*of Riparia and Labrusca extraction*).—Vine a fair grower, apparently hardy. Bunch rather small; berry medium, green, very thin skinned; pulp tender, of first quality; subject to mildew. Home use south of this point.

STRAWBERRIES.

The spring of 1891 was most unfavourable to fall-set plants, of which the new plantation is composed. Cold weather and high winds, coupled with the somewhat sandy nature of the soil, wrought much damage to a "stand" which the previous autumn was almost perfect. On this account reliable comparisons between varieties could not be made.

METHODS OF PLANTING.

In setting out the new plantation in the fall of 1890 two methods of planting were adopted. Half of each variety was planted in the ordinary way, by (1) making a hole deep enough to admit the roots without doubling them up, then spreading them carefully in all directions as much as possible, filling in the soil by hand, and taking care to compact it firmly; (2) The remaining half was planted by striking a spade across the line of the row. Into this cleft the fan-shaped roots were inserted and spread as much as the opening would admit, and the earth then packed well about them. This method requires a man and boy—the former to operate the spade, the latter to set the plants—and is much more rapid than the old style.

Results reached are:

1. A perfect stand of plants was obtained from both methods.
2. No difference in the health and vigour of the plants comprising the two sets was noticed.
3. The spade method being more rapid, cheaper, and equally satisfactory, is therefore recommended.

RENEWING OLD BEDS.

When old beds have become run out and lacking in vigour, it is occasionally found convenient to renew them without losing a crop. This may be accomplished by the following plan: As soon as the crop of berries has been picked, remove the mulch from between the rows, dress these interspaces with rotted manure, wood ashes, or some commercial fertilizer, which should be well worked in with a small plough or cultivator; then train the runners into these spaces. By the middle of September the young plants will have become firmly rooted, when a line is stretched on either side of the old rows, and the young plants separated rapidly from the old

with an edging knife, or sharp spade. In small plantations it will be found more convenient to use a spade than a plough in turning under the old plants; where larger, a plough will be found to be more economical.

Raspberries.

(*Propagated from Suckers.*)

"With a view to test the advantage as well as cost of protecting during the winter by laying down and covering with sufficient earth to hold them in position, half of the plants of each variety were pruned and treated in this manner. The relative returns from the two sections will be carefully noted next year." (Report for 1890.)

RESULTS.

1. The first effect was to hasten the ripening of varieties so treated from five to eight days.
2. With such hardy varieties as Turner and Hansel, the increased product and earliness did not more than repay the cost of such protection.
3. With varieties of the grade of hardiness of Cuthbert, Marlboro', Herstine, Heebner and Golden Queen, productiveness was increased 16 to 22 per cent. This, with the advantage of increased earliness, much more than repaid the cost of protecting.
4. It is fair to conclude that in this and similar latitudes, suckering raspberries of nearly all varieties are left unprotected at an actual loss to the owner.

YIELD OF VARIETIES.

Standard Red sorts yielded in the following order: *Cuthbert*, *Hansel*, *Turner*, *Marlboro'*, *Heebner*, *Reider*, *Clark*, *Hudson River Antwerp*, *Rancocas.*

Black Caps—*rooting from the tips*—*Shaffer*, *Hillborn*, *Gregg*, *Mammoth Cluster*, *Souhegan*, were productive in the order named and may be considered valuable in the same order.

Yellow.—*Golden Queen*—Is the best yellow berry for market and home use.

Brinckle's Orange, on account of its exceptionally fine quality, should be grown in a limited way for home consumption.

SEEDLINGS AND HYBRIDS.

With the experience of the past three years as a guide, a new trial plantation has been made by selecting the most promising, from the original large collection of seedling and hybrid raspberries, also the best of the named varieties of raspberries and blackberries.

The transplanting was done in October, after which a furrow was thrown up on each side of the rows, and the whole surface of the ground liberally manured. In this plot there are now 105 varieties of selected seedlings and hybrids; 35 named varieties of Black and Red Caps, and 20 kinds of blackberries. As a rule, there are 100 plants of all named sorts, and a quarter that number of the seedlings and hybrids.

Blackberries.

Paying results were obtained by laying down all varieties of blackberries in the fall of 1890. In order to accomplish this successfully the canes should not be pinched, before they have attained a height of from 3 to $3\frac{1}{2}$ feet. Care must be taken in bending the canes down to loosen the soil at the side of the root to which the plant is inclined, thus preventing the cane from snapping off at the base. As noted last year, *Agawam*, *Snyder*, *Stone's Hardy* and *Western Triumph*, with the addition of *Nevada*, which did exceptionally well the past season, can be recommended with confidence.

Currants.

Red and white currants gave satisfactory returns the past season. In point of productiveness the principal red varieties ranked in the following order: *Victoria, Raby Castle, Cherry, Fay's Prolific, Red Dutch, Red Grape, London Red, Prince Albert.* White: *White Grape, White Dutch.*

Black currants in low situations were a total failure on account of late frosts. A large number of seedlings of this class on higher ground fruited very freely.

Gooseberries.

Were unusually free from mildew during the early part of the season, but the disease developed considerably on unsprayed plants later in the summer.

Downing yielded twice the number of boxes per plant of any other variety. *Houghton*, though healthy and fairly productive, is small. *Pearl* gives increasing satisfaction, and without doubt will take a leading place among native gooseberries.

III.—VEGETABLES.

A large amount of data has been collected bearing upon various phases of successful vegetable growing, as well as facts regarding varieties, but for the present it is thought best to confine a report to the enumeration, with brief descriptive notes, of the most reliable and satisfactory varieties in each class, based upon our experience during the year. The soil upon which tests were conducted is a sandy loam in good condition, having been previously used for growing strawberries.

Cut-worms were kept in check by the use of poisoned traps, made by soaking clover hay or freshly-cut weeds in a strong mixture of Paris green in water. This method of destroying cut-worms has been advocated at length by Mr. James Fletcher, the Entomologist of the experimental farms, and is well worthy the careful attention of amateurs and market gardeners. Hellebore was also used with a fair degree of success in checking the injury caused by the cabbage-root maggot, as was pyrethrum when applied as a specific for the cabbage worm.

Beets.

A comparative test of thirty-one varieties was made the past season, including a number of the best French and English sorts.

The following list covers the most valuable of those tested, given in order of maturity.

Blood Turnips.—Round, smooth, dark red, maturing early; strain well selected; inclined to become hollow late in the season.

Eclipse.—Turnip-shaped, dark red, reaching edible maturity shortly after the preceding. Tops large; may be used for greens.

Lentz.—Round, medium in size and season, very even and regular. Foliage green with red veins; a desirable medium early sort.

Covent Garden Red.—Half long, light red, fair size; very even and desirable.

A few varieties usually grown for greens deserve special mention as ornamental plants. In bedding they might be used with good effect. Among these may be mentioned Dells Black Leaved, Reines des Noires, and Swiss Chard.

Cabbage.

Out of 60 varieties included in the experimental plots, the following will, for home use or market, probably prove most satisfactory:—

EARLY.

Early York.—An old and well-known variety; generally a sure header; oval in shape; very solid, varying in weight from 2 to 9 pounds.

Express.—Same season as last; type not quite as well fixed; heads round and solid; weight, 2 to 6 pounds.

Premier.—Roundish oval, vigorous thick leaf; a good early market sort, which averaged 5½ pounds per head this season.

Wakefield.—This is a sort of generic name, with which are associated Selected Early Jersey Wakefield, Early Jersey Wakefield, Jersey Wakefield, Long Island Wakefield, and Charlston Wakefield. There was practically no difference in the time of maturing of any of these. Seedsmen are too fond of prefixing adjectives to old sorts, or to fancied improvements, thus unnecessarily multiplying varieties.

Long Island Wakefield (Henderson) gave the greatest number of solid heads for the number of plants set out. Heads averaged 6 pounds.

Aroostook.—Heads round; very solid; strain is not completely fixed, but a very promising early sort, averaging 6 pounds per head.

MEDIUM EARLY.

Montreal Market (Evans).—Medium to large; round flat-topped; heads well and solidly; heaviest head, 15 lbs.; lightest, 5½ lbs.

Succession.—Last year as well as the past season, this has proved itself one of the most valuable midsummer varieties; average weight this year, 11 lbs.

Schweinfurt (Simmers).—Large, flat, solid; a sure header; averaging 10 lbs. per head.

LATE VARIETIES.

Fottler's Brunswick.—Large, round, leafy; one of the best medium early or late market sorts. Average weight, 11 lbs.

Brunswick Short Stem (Pearce).—Much like last, but later; heads of the largest size, round, flat, weighing on an average 12 lbs.

Hyde Park (Hallock).—One of the largest and best in the list for late market; head round solid; average weight, 13½ lbs.

Mammoth Rock Bed (Henderson).—Probably the best of the large late-pickling sorts.

Drumhead Savoy (Pearce).—Medium size; very firm and a sure header; average weight, 5 pounds; one of the best varieties for winter storing.

CAULIFLOWER.

Owing to the extreme drought already referred to, very few of the thirty varieties of this vegetable gave satisfactory and reliable results; many failed to head, while others, especially early varieties, headed prematurely, consequently fell below the characteristic size. *Early London* and *Autumn Giant* headed best and gave the most satisfactory returns. The latter is exceptionally large, and a sure header.

CELERY.

A varietal test, in which thirty kinds of this vegetable were included, was made. Seed sown on 31st March appeared in fifteen to twenty days. The lowest per cent found to germinate was 17 and the highest 74 per cent. After transplanting twice and cutting back once, it was set out in well-manured trenches on 22nd June. All varieties were twice handled before earthing the 1st September. Treated in this way, there was not more than five days difference in the time of edible maturity of any variety. But this early earthing up had a very deleterious effect upon the keeping quality of the late sorts; nearly all of this class were affected with heart or stalk rot—a disease said to be of bacterial origin—which, in a few cases, entirely destroyed some varieties, and in all cases prevented their being kept for more than a few weeks. The spread of this disease may have been peculiarly favoured, and aggravated by the unusually hot weather during September. Varieties earthed two weeks latter did not suffer to the same extent.

Last year the following varieties were recommended, and there does not seem to be any good reason for changing the list this year:—

Paris Golden Yellow (Steele Bros.)
White Walnut (Henderson).
Half Dwarf (Henderson).
White Plume (Ewing).
Sandringham.
Giant Golden Heart (Vaughan).
Red Giant Solid.

Golden Heart (Pearce)—A small growing, rather early variety; good quality; very satisfactory this year.

Giant Pascal.—One of the best tall-growing late sorts; generally crisp, with fine nutty flavour.

Pease.

The following selection, out of sixty varieties on trial, proved most satisfactory, season, yield and freedom from mildew considered:—

Early.

Dan'l O'Rourke, *R. N. Yorker*, *Vick's Early* and *Lightning*, tall-growing sorts, needing stakes or trellis. These were in edible condition 55 days after sowing, though much retarded by late spring frosts and cold.

First and Best, *First of All*, and *Philadelphia* are half-dwarf sorts, reaching edible maturity about the same time.

Second Early.

Little Gem, *Small French* and *Blue Peter* reached edible condition in 70 days after sowing. *American Wonder*, a dwarf variety, is a few days earlier, and might be classed with the early sorts; on most soils it is not sufficiently productive for market. *Bliss' Abundance* and *Yorkshire Hero*, very productive varieties of medium height, are ten days later than the first mentioned of this group.

Late.

Sanders Marrow, *Black-eyed Marrow-fat*, and *White Marrow* complete the season; fit for table use 90 days after sowing.

Edible Podded.—A number of so-called edible podded varieties are now on the market. Some of them are extremely palatable, and valuable additions to our list of vegetables.

Dwarf Sugar, which is an evident misnomer, as it grows to a height of 4½ feet, reaches edible maturity in 70 days. One of the best.

Tall Sugar, about 15 days later than the last, and somewhat taller; is very desirable on account of the size and succulence of the pods.

Peppers.

Good treatment of tomatoes will, when applied to peppers, give fair results, though the number of varieties suited to this latitude is proportionately less than in the case of tomatoes. A germination test showed that the seed of many varieties were lacking vitality, six out of thirty giving a return of less than 7 per cent—practically worthless.

The following are among the earliest to ripen and most productive, therefore best adapted to the conditions of this and similar localities:—

Cardinal.—Ripe, August 10; fruit pendant, scarlet, 4 to 6 inches long, pointed; very prolific; one of the best market sorts.

Ruby King (Pearce).—A vigorous grower; fruit very large, pendant, handsome and attractive. Beginning to ripen August 27.

Squash (Henderson).—A very distinct variety, the fruit much resembling, in form and colour, a tomato. Plant a fair grower and fairly productive; medium to late, ripening with the last.

Golden Dawn (Henderson).—Vigorous grower; fruit large, bright yellow. Prolific and medium early.

Coral Gem (Northrup and Braslan).—A dwarf variety; fruit small oval, bright scarlet; held upright in such a manner as to make it a very desirable pot-grown plant for house decoration. Useful, also, for pickling.

Tomatoes.

The work of testing the old, and the many new varieties constantly being introduced, was carried on again this year. The experimental plots contained fifty-seven varieties of eight plants each. The seed was sown in boxes in the green-house on 16th March, pricked into other boxes 2 inches apart on 10th April, and potted about three weeks later, using 3-inch pots. Setting out was delayed considerably by the cold weather of May, and did not take place until 4th June.

In testing the seed of each variety much variation was found. The highest per cent found to germinate in any case was 92 and the lowest 20 per cent. The average vitality of the entire collection was found to be 63·1 per cent. In view of this wide variation, it is essential, for market gardeners especially, to carefully test samples of seed in advance of the sowing period, in order to gain an intelligent idea of the probable return, and quantity of seed required. Where considerable quantities are used, it will be economical to purchase at an early date, small samples for testing purposes before ordering the main supply.

With a view of testing the effect of mulching as a rot preventive, a strip running across the plots, including several varieties, was heavily mulched with coarse strawy manure, containing, however, a very small proportion of fertilizing material. The fruit was carefully examined, at various times during the ripening season, but no appreciable difference in quality or quantity could be detected, although the crop of fruit on the mulched strip was somewhat later in ripening than on those unmulched. In this and similar climates it is of prime importance to select early-ripening varieties, start them early, transplant or re-pot frequently, and set out strong plants after danger of spring frosts is past.

The following list includes the twelve earliest varieties, all set out on 4th June: *Electric* or earliest (Northrup, Braslan, Goodwin & Co.) gave the first ripe fruit on 26th July, followed by *King Humbert, Atlantic, Early Ruby, Early Advance, Conqueror, Acme, Canada Victor, Mikado, Hathaway, Cumberland Red, Thorburn's Long Keeper.*

The following twelve varieties gave the largest yield of ripe fruit up to 15th September:—

Hubbard's Early,	General Grant,
King Humbert,	Henderson's 400 (Ponderosa),
Horsford's Prelude,	Conqueror,
Mikado,	Canada Victor,
Early Ruby,	Cumberland Red,
Thorburn's Long Keeper,	Hathaway.

The following twelve varieties gave the largest yield of fruit ripening before frost:—

Horsford's Prelude,	Canada Victor,
Thorburn's Long Keeper,	Cumberland Red,
Essex Hybrid,	Climax,
Hubbard's Early,	Volunteer,
Mikado,	Mitchell's No. 1,
Golden Queen,	Conqueror.

EFFECT OF DIFFERENT FERTILIZERS.

The accompanying table gives the results from the use of various fertilizers as affecting productiveness. The soil upon which the plants were grown was in a fair state of fertility, and ordinarily would not be considered as needing manure of any kind; yet it will be seen that the application of the different fertilizers was in each case helpful.

TOMATOES.

Effect of Fertilizers—Comparative Yields from One Plant of each Variety.

Fertilizers.	Paragon.		Queen.		Trophy.		Electric.		Table Queen.		Early Ruby.		Sunrise.		Total amount of fruit ripened.	Total amount of fruit unripened.	Average yield per plant ripe fruit.
	Ripe.	Green.	Ripe.	Green.	Ripe.	Green.	Ripe.	Green.	Ripe.	Green.	Ripe.	Green.	Ripe.	Green.			
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Nitrate of soda	11	2	7	3	16	4	6	......	19	4	22	......	13	5	94	18	13·2
Muriate of potash	13	4	14	4	15	4	12	6	13	1	16	4	16	4	99	27	14·1
Superphosphate No. 1	15	5	9	5	19	7	10	......	19	4	22	5	18	7	112	33	16·0
Wood ashes	15	6	20	5	12	3	21	......	18	1	16	1	14	6	116	22	16·1
Barnyard manure	19	7	15	3	20	5	16	.....	18	1	24	3	15	8	127	27	18·1
Unfertilized	9	3	10	5	8	3	12	5	16	1	21	6	13	5	89	28	12·7

Nitrate of soda, muriate of potash and superphosphate No. 1, were used in two applications at the rate of 300 lbs. to the acre. The first application was made at time of transplanting; the second three weeks later; **wood ashes applied in the same way at the rate of 50 bushels per acre; barnyard manure at the rate of 6 tons per acre.**

IV.—FORESTRY.

Distribution of Seedling Forest Trees.

This line of experimental work, inaugurated in 1890, has met with such hearty approval and co-operation at the hands of the settlers of the North-West Provinces and Territories, that it was decided by the Honourable the Minister of Agriculture to double the number of seedling trees sent out the first year. Accordingly, about 200,000 trees were distributed, each package being prepared for mailing in the same manner as that described in the report for 1890.

The records show that 260 post offices in Manitoba received 1,022 packages, while 130 post offices in the North-West Territories received 883 packages. Ninety-five bundles were distributed throughout the Dominion to specialists who are particularly interested in forest extension and preservation.

With a few exceptions, each package contained the following selection:—

10	Green ash.	Fraxinus viridis.
10	White ash.	Fraxinus Americana.
2	Soft maple.	Acer dasycarpum.
2	Sycamore.	Platanus occidentalis.
2	Linden.	Tilia Americana.
20	American elm.	Ulmus Americana.
6	Manitoba elm.	Ulmus Americana var?
2	Black cherry.	Prunus serotina.
2	Black walnut.	Juglans nigra.
2	Honey locust.	Gleditschia triacanthos.
5	White birch.	Betula Alba.
3	Canoe birch.	Betula papyracea.
2	American mountain ash.	Pyrus Americana.
4	Yellow cottonwood.	Populus monolifera var?
4	Riga pine.	Pinus rigænsis.
4	Norway spruce.	Picea excelsa.
1	Arbor vitæ.	Thuja occidentalis.

About 500 Dwarf Mountain pines (*Pinus Montana*) were also sent out, being occasionally substituted for varieties which were exhausted before the total number of packages was completed. More than 300 reports have been received, going to show that the trees, with few exceptions, arrived in good condition and made fair progress during the first season.

It has, however, been uniformly noted that *Honey Locust*, *Black Locust*, *Black Walnut* and *Russian Mulberry* did not ripen their wood sufficiently to escape injury by the first autumn frost. It is not expected that these varieties will succeed at any point in the noth-western country. Settlers are specially cautioned in regard to the Russian Mulberry, which is often unwarrantably lauded on account of alleged hardiness, and are advised to be content for the present with the best varieties of native trees; when with these a certain amount of shelter has been obtained, other less reliable varieties may in a limited way be tested.

A collection of forest trees of larger size was also sent by express to the superintendents of Indian agencies, to officers commanding the various posts of mounted police, and to each of the trial gardens of the Canadian Pacific Railway.

Distribution of Tree and Vegetable Seed.

In addition to the seeds sent out in December, 1890, small bags containing from three to five thousand seeds each have been distributed as follows :—

Variety.	No. of Bags.	
	Manitoba.	North-West Territories.
Box elder (Negundo aceroides)	1,377	1,188
Green ash (Fraxinus viridis)	613	604
VEGETABLE SEED.		
Asparagus	731	780
Rhubarb	842	780

The samples of asparagus and rhubarb seed were put up in suitable-sized envelopes, with printed instructions for planting and cultivation, and enclosed with the tree seeds.

Of Asparagus, *Conover's Colossal* and *Palmetto*, and of Rhubarb, *Carleton Club*, *Paragon* and *Stott's Mammoth*, were the varieties distributed.

Miscellaneous Distribution.

One hundred and fifty packages, including 12,500 plants, were sent out to various parts of the Dominion, more or less remote from nursery men. The following varieties were used in making this collection :—

SMALL FRUITS.

Raspberries.—Cuthbert, Turner, Hansel.
Strawberries.—Crescent, Bubach, Capt. Jack.
Apple Trees.—Saccharine, Bode, Silken Leaf, Little Hat, Blushed Calville.
Shrubs.—Rosa rugosa.

FOREST TREES.

Riga pine, Norway spruce, green ash, white ash, box elder, American elm, white birch and soft maple. Appropriate instructions accompanied each package. *See* report for 1890, page 94.

V.—FUNGICIDES.

Apple Scab.

Some experiments were conducted last summer with the co-operation of Messrs. Wm. Craig, jun., and J. M. Fisk, of Abbotsford, Que., which were designed to throw light upon the following points in the treatment of apple scab :—

1. The relative efficacy of copper carbonate in suspension and solution.
2. The relative efficacy of copper carbonate unwashed (a modified eau-celeste) in solution and in suspension.
3. The possibility and effect of using Paris green with these mixtures.

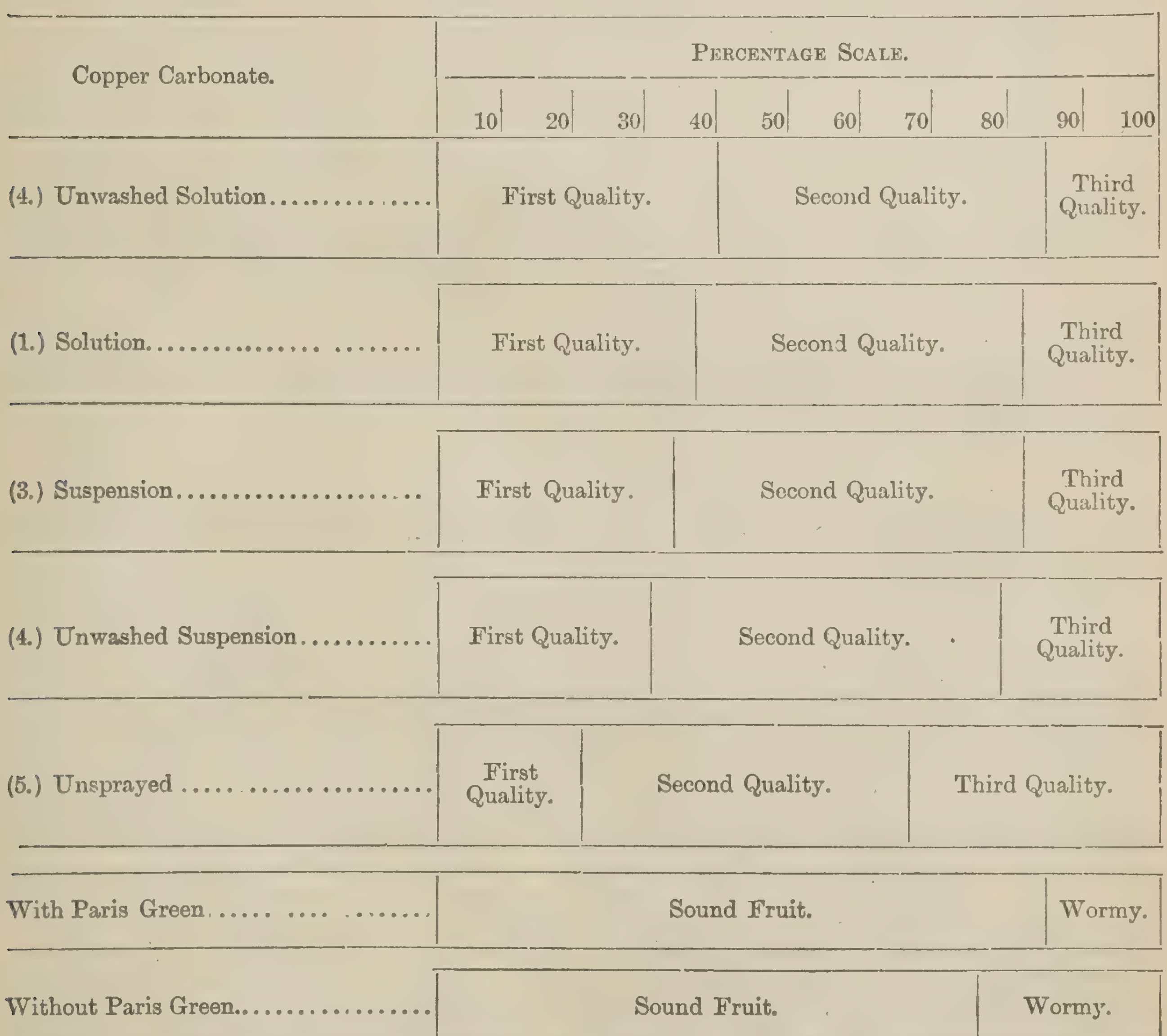
The results are given in detail in the accompanying table, and may be briefly summarized as follows :—

1. Paying results were obtained from the application of all of the mixtures.
2. In no case was the foliage injured.
3. The unwashed solution (a modification of eau-celeste) gave the best results, and the same preparation in suspension the lowest returns.
4. The addition of Paris green to the fungicides at the time of the second application had no injurious effect upon the foliage, and increased the quantity of sound fruit 8·2 per cent.

Table showing per cent of Fruit of First, Second and Third Quality, also per cent of Sound and Wormy Fruit.

Copper Carbonate.	Per Cent First Quality.	Per Cent Second Quality.	Per Cent Third Quality.	Per Cent of Wormy Fruit with Paris Green.	Per Cent of Wormy Fruit without Paris Green.	Per Cent in favour of Paris Green.
1. Solution..........	38·8	46·6	14·5	21·6	26·6	5·
2. Suspension..	33·5	52·	14·5	16·9	25·9	9·
3. Unwashed Suspension..........	33·	50·	17·	10·5	22·3	11·8
4. Unwashed Solution....	42·5	46·5	11·	8·5	15·	6·5
5. Unsprayed	18·	51·	31·	18·	27·	9·

COMPARATIVE RESULTS.



DETAILS OF THE EXPERIMENT.

The trees selected were of the Fameuse variety planted fifteen years ago, and having made good growth are now of fair size. Six trees were set apart for each test. Three applications were made in each case, the first one on the 22nd of May, when the leaves were about half-formed and the blossoms just beginning to open. At the time of the second application, 8th June, Paris green at the rate of 1 lb. to 200 gallons of water was added to each mixture when *fully diluted.* This was applied to three trees in each lot, while the remaining trees were left as checks. On the 20th of June they received the third treatment, and in the same manner as that on 22nd May. The apples were carefully hand-picked and graded, the per cent of wormy fruit in a representative bushel of each class being ascertained by actual count, and the total percentages deduced therefrom.

FORMULÆ.

The following are the formulæ used in the experiment detailed above, of which the individual results are shown in the tables.

1. Solution.

Carbonate of Copper	1½ oz.
Ammonia	1½ pts.
Water	25 galls.
Paris Green (added in second application)	1¾ oz.

2. Suspension.

Carbonate of Copper	1½ oz.
Water	25 galls.
Paris Green (added in second application)	1¾ oz.

A slightly increased quantity of Paris green was used in this instance, as without the ammonia solvent there is less danger of injuring the foliage.

3. Unwashed Solution.

Has the constituents of No. 1 present in the same quantities.

In Bulletin No. 10 the following directions were given, which it is thought well to repeat here :—

HOME MANUFACTURE OF COPPER CARBONATE.

As the precipitated form of carbonate of copper is not always obtainable from druggists, directions are herewith appended for the easy preparation of this material at a cost much less than the usual wholesale price.

In a vessel capable of holding two or three gallons, dissolve 1½ pounds of copper sulphate (blue vitrol) in 2 quarts of hot water, using the crystalline form. This will be entirely dissolved in fifteen or twenty minutes. In another vessel dissolve 1¾ pounds of sal soda (washing soda), also in 2 quarts of hot water. When completely dissolved pour the second solution into the first, stirring briskly. When effervescence has ceased fill the vessel with water and stir thoroughly; then allow it to stand five or six hours, when the sediment will have settled to the bottom. Pour off the clear liquid without disturbing the precipitate, fill with water again and stir as before; then allow it to stand until the sediment has settled again, which will take place in a few hours. Pour the clear liquid off carefully as before, and the residue is *carbonate of copper.* Using the above quantities of copper sulphate and sal soda, there will be formed 12 ounces of copper carbonate.

Instead of drying this, which is a tedious operation, add four quarts of strong ammonia, stirring in well; then add sufficient water to bring the whole quantity up to 6 quarts. This can be kept in an ordinary two-gallon stone jar, which should be closely corked.

FORMULA.

Each quart will contain 2 ounces of the carbonate of copper, which, when added to 25 gallons of water, will furnish a solution for spraying, of the same strength and character as that obtained by the use of the dried carbonate, and one which can be prepared with little labour, and kept ready for use throughout the season.

CARBONATE OF COPPER IN SUSPENSION.

When the carbonate is to be used in suspension, instead of adding the ammonia to the sediment, add water until the whole quantity is made up to 6 quarts. Stir this thoroughly until the sediment is completely suspended (entirely mixed throughout) and pour the thick liquid into a suitable jar, when it will be ready for use.

Before using shake the contents thoroughly, so that all the sediment may be evenly distributed in the water. Pour out a quart of the thick fluid and mix in the 25 gallons of water. The *unwashed solution* is prepared by simply pouring the two solutions together (copper sulphate and sal soda), and when the effervescence has ceased, pouring off the top or supernatent liquid ; add four quarts of strong ammonia, stirring in well, then add sufficient water to bring the whole quantity up to 6 quarts. The formula is the same as that already given above.

The *unwashed suspension* is prepared in the same way, water taking the place of ammonia in making the quantity up to 6 quarts.

GRAPE MILDEW.

As stated elsewhere, grape mildew (*Peronospora viticola*) was effectually kept in check in the farm vineyard by three applications of ammoniacal copper carbonate, as recommended in Bulletin No. 10.

With the co-operation of his Honour Judge Mosgrove, an extensive grape-grower on the Richmond road, a series of experiments were planned and designed : (1) To show the relative effectiveness of different strengths of copper carbonate in solution and in suspension; (2) To show the benefit of spraying the vines, immediately on being uncovered, with copper sulphate.

The results, owing to the appearance of an unlooked for and unexpected disease (*Sphaceloma ampelinum*), have not been conclusive, and the work will be continued another season, when it is hoped the objects of the experiment will be attained.

Little if any mildew appeared in any case upon the fruit of those treated, though in a few instances the foliage was affected.

The first application was made on 22nd May, using a solution of copper sulphate, 1 lb. to 25 gallons of water. This was followed by four applications of the ammoniacal copper carbonate, made on the following dates: 2nd, 13th and 30th June and 31st July.

While this treatment was generally satisfactory in the case of the downy mildew, it was not so with "bird's-eye rot" (*Sphaceloma ampelinum*). In order to rid the vineyard of this pest, treatment was commenced this fall by carefully burning all rubbish and trimmings, and spraying one-half of the vines with a strong solution of copper sulphate, the other half with iron sulphate. Next spring, on the vines being uncovered, they will be again treated with the copper and iron solution, followed by dilute Bordeaux mixture and ammoniacal copper carbonate, used in a comparative way. It is hoped that by this treatment both the bird's-eye rot and downy mildew will be controlled.

GOOSEBERRY MILDEW.

Comparisons were made as to the effectiveness of copper carbonate, in solution and suspension in different proportions, and potassium sulphide used also in varying quantities. While the disease (*Sphaerotheca mors-uvæ*) was not as prevalent as usual this year, yet on the European varieties and seedlings it was sufficiently active to make the results quite conclusive. These are summarized as follows :—

Five applications were made in each case:

1. Potassium sulphide, 1 oz. dissolved in three gallons of water, gave the best results, keeping the foliage practically healthy and free from disease during the whole season.

2. Potassium sulphide, 1 oz. to four gallons; stood second in order of effectiveness.

3. Ammoniacal copper carbonate, 3 oz. to twenty-five gallons; stood third; fairly effective.

4. Suspension mixtures of copper carbonate did not give a sufficient degree of immunity to pay for cost of materials and time of application.

REPORT OF THE CHEMIST.

(Frank T. Shutt, M.A., F.I.C., F.C.S.)

Wm. Saunders, Esq.,
Director Dominion Experimental Farms,
Ottawa.

Sir,—I have the honour to submit herewith the fifth annual report of the Chemical Department of the Dominion Experimental Farms.

The analytical data contained in the following pages and obtained in the laboratories of the experimental farms embrace the results of work of a very varied character. Assistance both by experiment and analysis has been rendered during the past year to the numerous branches of agriculture, and it is confidently hoped that the information here found will prove of much practical benefit to the dairymen, the horticulturists and the general farmers throughout the Dominion.

The increasing interest taken by farmers in this department of the Experimental Farm system has resulted in an increased demand upon our time, both in the matter of analysis of samples sent for examination, as well as in answering enquiries from those seeking advice and information. With regard to the latter, it will suffice to say that over 1,200 letters have passed, in 1891, between myself and correspondents on matters pertaining to the science and practice of agriculture. Respecting the accumulation of samples of substances forwarded for analysis by farmers, I can but repeat what I have said in a former report. Although a large number of these have been examined and reported upon, as the present report testifies, many still await analysis for lack of time. In addition, there are the experiments and analyses planned and carried out by this department. The results of this original research I deem of great value to the Dominion as a whole. It is a branch of the work I am anxious to develop more and more as time and assistance permits. All this points to the fact, that in order to cope successfully with the work of the chemical department in the future, further skilled help will be required in the laboratories.

During the year addresses have been delivered at several conventions and meetings of farmers' institutes on agricultural topics. The large attendance at these meetings, and the keen interest taken by those present, as evinced by the lively discussions which usually follow the addresses, clearly show that the farmers are not only eager to learn, but also ready to avail themselves of these opportunities for increasing their knowledge in agriculture.

For the convenience of readers and for ready reference, I have classified the matter in the present report, according to the plan adopted last year. The following brief epitome outlines the subjects treated in the following pages:—

Part I, Soils.—Twenty-four soils have been analysed during the past year. Many of these were virgin soils and included samples taken from the surface and subsoil. These represent the character of the soil over comparatively large areas. Among those examined were several specimens of so-called alkali soil from Manitoba and the North-West Territories. Sufficient data have not as yet been obtained to enable a complete diagnosis of the cause of the apparent barrenness or poisonous nature of these soils, nor can we as yet advise with confidence any treatment for their amelioration. The remarks on the work done in this connection, however, will, it is hoped, assist in some measure, by outlining probable methods for their improvement. The investigation into the character of these soils will be continued during the coming year

With regard to the virgin soils of Manitoba and the North-West Territories in general, I may state that the chemical data emphatically point to their excellence and great fertility.

Some soils from the district of Muskoka, as well as others from Ontario, Quebec and Nova Scotia, have also received attention.

It would be well to emphasize that more analytical results are required before inferences as to the relative fertility of districts in Canada can be drawn. In the meantime the analyses here given, together with the deductions made, will serve to indicate the general character of many classes of our soils, and assist in suggesting the most economical and profitable means for their improvement.

PART II. NATURAL FERTILIZERS.—There is here included the analyses of twenty-seven samples of swamp muck, mud and peat from different parts of Canada. Their compositiou is tabulated and their use and value as fertilizers explained. Analyses of eel grass and of spent tan-bark, made at the request of correspondents, are here given. The results of an examination of a sample of gas liquor are also stated.

PART III. FODDERS, PLANT AND ANIMAL PRODUCTS.—*Roots.*—The chemical examination of roots has formed a part of this work during the past season, and this chapter comprises the analyses of several varieties of carrots, turnips, mangels and sugar beets grown on the experimental farm at Ottawa. Their composition is given in tabular form, which allows of an easy comparison of their food values. The useful and important functions of roots as part of cattle rations are also considered.

Fodder Corn.—The results of experiments with fodder corn carried out at the experimental farm, Ottawa, in conjunction with the Dairy Commissioner, are given. These corroborate and supplement those obtained in 1890, which were published last year in Bulletin 12 of the Farm series. The attention of farmers and dairymen may be specially directed to this work. Further experiments with analyses of fodder corn and ensilage are in progress.

Sugar-beets.—The investigation that has continued for the past three years with a view of ascertaining the value of this crop for sugar manufacture has received further attention. Sixty-four samples of this season's roots are reported on. The average of 21 samples of the same variety grown at Ottawa was 14 per cent of sugar. In another table will be found figures showing the effect of earthing up the roots while growing. This practice resulted in an increased sugar content of 2·2 per cent over that in the same varieties which had only received ordinary field culture. In a third table are the analyses of beets grown at the branch experimental farms and roots sent in from various parts of Ontario.

Sorghum.—A short chapter on sorghum grown at Ottawa is added.

Babcock Method.—In June last a bulletin was issued on the Babcock method for ascertaining the amount of fat in milk. It contained analyatical data obtained in our laboratories proving the accuracy and reliability of this process. As the value of milk depends chiefly on the amount of butter-fat it contains, it becomes at once apparent that any method by which this could be easily and cheaply determined would prove itself most valuable in placing the purchase and sale of milk on a good business foundation. The importance of this subject I consider warrants the insertion of the principal facts and deductions already published. Further experimental work is in progress, with a view to lessening the time employed in making the test by the analysis of composite samples once or twice a week.

Condensed Milk.—In view of the possible development of the condensed milk industry in Canada, several brands of this article were carefully and thoroughly examined.

PART IV. MISCELLANEOUS EXPERIMENTS AND ANALYSES.—*Well Waters.*—In previous publications we have impressed upon farmers and dairymen the necessity of pure water for their stock. During 1891, 29 samples of well-water were sent for examination. The reports on these are here presented.

Prevention of Smut.—Further results of experiments inaugurated two years ago for the treatment of wheat for the prevention of hard smut by certain solutions are here reported. The effect on the vitality of the wheat germ by iron and copper

salts, stated in last year's report, have been corroborated, while, in addition, the experiments made this year go to show that copper sulphate and "agricultural bluestone" are far more efficacious for the prevention of the development of smut than sulphate of iron.

Fertility of Soil not injured by Spraying.—An impression was going abroad that the copper solutions used in spraying for fungus diseases was affecting disastrously the fertility of our soils, and an article to this effect lately appeared in one of our leading papers. I have, therefore, written a short chapter, discussing the nature of the application and the chemical changes involved. These all go to show that the assertion that the soils are "poisoned" by this useful operation is fallacious.

Insecticides with Soap Solution.—There are many cases in which it is desirable to apply the insecticide Paris green in soap solution. The question then arose: Is the effect of Paris green weakened by the soap? As I was requested to give an opinion on this matter, I undertook a number of experiments, the results of which are enumerated in this report. They show that the efficacy of this insecticide is not materially affected by being applied in soap solution.

Sprayed Apples are not poisonous.—The last chapter of this report contains the results of an experiment undertaken to afford scientific proof for the refutation of the statement that "apples sprayed for codling moth are dangerous to health, if not positively poisonous, owing to the presence of arsenic of the Paris green used in the operation of spraying."

Some few months ago a statement to this effect appeared in an English horticultural paper. This report received wide circulation in the press generally, and was calculated to do much harm to the Canadian export apple trade. I therefore made a very careful analysis of apples that had been twice sprayed (Paris green 1 lb., water 200 gallons), and though the process employed was one of extreme delicacy, not a trace of arsenic could be detected. This result gives additional support to the statement that the suspicion that Canadian apples are poisonous is entirely without foundation. The publication of this positive proof of the absence of arsenic in these sprayed apples should serve to assure those in England, as well as Canadian horticulturists and apple exporters, that this practice, so useful in prevening the ravages of the codling moth, does not result in poisoned apples.

I again with very much pleasure record my thanks and indebtedness to Mr. Adolph Lehmann, B.S.A., the assistant chemist, for the valuable aid he has rendered me. Mr. Lehmann has devoted himself most assiduously to the work of the department since his appointment, and many of the analytical data contained in this report are the result of his ability and industry.

I have the honour to be, Sir,

Your obedient servant,

FRANK T. SHUTT,

Chemist, Dominion Experimental Farms.

CHEMICAL LABORATORIES,
CENTRAL EXPERIMENTAL FARM,
OTTAWA.

PART I.

SOILS.

The factors upon which the fertility of a soil depend are many. The amount of plant food and its degree of solubility, the mechanical texture or tilth and the climate (temperature, amount of rain-fall, &c.) are the chief. It is very evident, therefore, that chemical analysis alone cannot give all the information necessary to a full knowledge of a soil's productiveness, but that it is exceedingly useful to that end will be apparent to those who have given this important subject careful thought. A good mechanical condition and a favourable climate would prevail nothing for the growth of crops unless those elements necessary for plant sustenance were present. Chemical analysis gives the composition of a soil or the amount of these fertilizing elements; unfortunately, in the present state of the science, it can give us but little exact information as to the degree of solubility or assimilation of such.

The amounts of nitrogen, potash and phosphoric acid, together with other elements of plant food of minor importance, as obtained by means of analysis, I propose to call the "total fertility" of a soil. The value of the knowledge of this "total fertility" in arriving at a soil's relative productive power and its more especial needs, will be apparent upon reflection. For, if on the one hand it proves a soil to be barren of any of those substances necessary for plant development, we know that certain manures must be added before profitable crops can be expected; if, on the other hand, a soil is shown to contain these materials in abundance, we may be sure that with proper working and favourable climatic condition, this food will be converted into assimilable forms. The matter of soil analysis is one of great importance. Unfortunately, it is one involving a very large amount of skilled labour, as the operation is not only lengthy, but must be performed with the greatest care, from the fact that the most fertile soils contain plant food only in comparatively small quantities, and that the differences in these quantities between rich and poor soils are represented by fractions of a per cent. We are, therefore, unable to undertake the analysis of all the samples that may be sent for examination, and are obliged to restrict this work to those specimens of virgin (unmanured and uncropped) soils that are representative of large districts in the Dominion. Several samples, however, of "alkali" and other soils, which demanded special attention, have, in addition to these virgin soils, been examined. In all, twenty-four samples have been analysed during the past year, the composition of which is fully set forth in the following table. Several enquiries have been received by me from Great Britain regarding the composition of our soils, and it is, therefore, probable that this work done in the laboratories of the Farm may be found useful for those in the old country who are considering the various provinces of the Dominion as fields for emigration. It must be distinctly understood that the data here given are altogether too meagre to form the basis of any broad conclusion as to the relative fertility of the lands of any district, yet they may serve in the meantime, and until further work of this character is done, to indicate the nature of some of our soils.

Alkali Soils.

Three specimens of so-called "alkali" soils from the North-West Territories, have been carefully analysed. In each instance the sender stated that such occurred in patches—sometimes only a few feet square, sometimes larger—surrounded by land of excellent fertility. The earth of these spots or patches though black when moist and first turned up, dries out more or less white. In these places the seeds of roots and cereals will germinate, but the plants soon dwindle away, the former attaining only the size of a gooseberry, and the latter turning yellow and dying at the height of a few inches. Mr. Bedford, Superintendent of the Manitoba experimental farm, writes that these patches generally occur in low lands with clay

subsoil, which possess very inadequate drainage. My examination of this class of soils is not yet complete, and experiments are now in progress that may result in throwing some light as to their proper treatment. But as far as the work has progressed it would seem—at all events in those analysed—that a large excess of alkali (salts of soda) is not present. There can be no doubt that the amount of soluble inorganic matter, including alkali if present, varies in the upper strata of soil according to the temperature and extent of rainfall, but it is at least worthy of note that those examined, and which have been held to possess alkali, should contain such small quantities of these salts of soda. Whether this may in part be due to the season at which the samples were collected, I am unable to say. In two of those examined, Nos. 4 and 7, there are notable percentages of sulphate of magnesium (epsom salts), and I am now experimenting to ascertain if this salt in quanties such as have been found, is deleterious to vegetation.

The amelioration of such soils is a subject of great importance to the farmers in many parts of the North-West Territories and Manitoba, and rightly forms an object for our investigation. As the alkali is soluble in water, a thorough drainage system should be resorted to wherever practicable. I am firmly of the belief that this would be the most efficacious method of getting rid of the poisonous material. Deep ploughing should be practised. Thorough tillage prevents surface evaporation and the accumulation of alkali near the surface. A heavy dressing of barn-yard manure, animal refuse or other highly nitrogenous organic matter, is said by many to materially improve these alkali patches, inducing a vigorous growth. Again, by others gypsum is strongly recommended, though I have not received any strong evidence of its efficacy. Where the alkali is carbonate of soda, gypsum is, however, beneficial in converting this caustic salt into one less deleterious to vegetation. Further work and experience it is hoped will enable us to give more definite information regarding the improvement of these soils, which in other respects would be termed very fertile.

Constituents of Soils.

In Part I of my last report (1890) is to be found a short history of soils in general, as well as an account of the changes which are continually taking place in them due to fermentation processes and atmospheric agencies. I therefore now append only a very brief statement of the amount and functions of the more important elements of plant food in soils, reserving a notice of the special characteristics of the specimens analysed when considering the soils individually.

The most important inorganic constituents of a soil are potash and phosphoric acid. These, together with nitrogen, are known as the *essential elements* of plant food.

Potash—derived principally from the decomposition of feldspathic rocks, *e.g.*, granite—exists chiefly in combination with silica in a more or less soluble condition. The limits of potash in a soil lie between a mere trace and about 2 per cent. A good agricultural soil contains between ·25 per cent and 1 per cent. Clay soils, usually, are the richest in potash.

Potash, as a fertilizer, is of special value to clover, pease and other leguminous crops; potatoes, beets, cabbage, grasses and leafy plants in general are also benefited by it. It should form a large part of manures for orchards and all fruit trees.

Phosphoric acid, combined principally with lime, is found in all fertile soils. Like potash, it has been derived from the rock that originated the soil, and consequently is not constant in quantity. It never exceeds 1 per cent, even in the richest soils, and the average in good soils is about ·2 per cent.

It benefits chiefly root crops, *e.g.*, turnips and beets, and in conjunction with nitrogenous manures is very effective for the cereals, promoting an early maturity and an increased yield.

Lime.—Of the inorganic elements of minor importance, lime is the principal. It affords food directly to the plant and liberates in the soil potash and nitrogen preexistent in insoluble forms. Many consider that less than 1 per cent shows a soil to be deficient in lime, and calcarious soils are almost invariably fertile.

No special mention need here be made of the other mineral constituents, as most soils contain sufficient for all the requirements of farm crops.

Nitrogen is the element of value in the organic portion of a soil. It there exists, for the most part, in forms from which it can be but slowly absorbed by plants. By a process of fermentation, known as nitrification, it is rendered assimilable. The presence of lime (carbonate of lime) appears to assist in this useful operation, especially when the ground is sufficiently open for air to permeate it. Moisture and warmth are also necessary to encourage the growth of the microscopic ferment which causes the formation of nitrates from nitrogenous material.

Very rich soils contain from ·5 per cent to 1 per cent of nitrogen; good, fertile soils possess on an average from ·15 per cent to ·25 per cent.

Nitrogen is essentially the fertilizer for cereals, especially when associated with phosphoric acid. An excess of nitrogen, however, promotes a rank growth of straw.

The following notes regarding the source and character of the soils examined, will be found useful when studying the analytical data in the annexed table:—

No. 1. A greyish-black soil of fine texture from the valley of the Fraser River, sent by Wm. Tasker, of Ladner's Landing, B.C. It has resulted from the deposition of the silt brought down by this river. An area of over 30 square miles is said to be covered by soil of this origin and character.

Both from chemical analysis and physical appearance, this soil should be an extremely fertile one, provided other conditions are favourable. It possesses potash, phosphoric acid and nitrogen in quantities considerably above those in rich, fertile soils.

No. 2. A surface soil, from Yorkton, N.-W.T., forwarded by Mr. R. Mitchell, of Carlow, Ireland, who had visited the larger portion of the North-West Territories, with the view of ascertaining the relative advantages offered there to settlers. It is a black, sandy loam, containing a large amount of organic matter and nitrogen. In potash and phosphoric acid it also ranks with the most productive soils.

No. 3. Subsoil to the preceding sample.

A knowledge of the composition of a subsoil is valuable as an aid to good practice. It is often beneficial to mix by deep ploughing the subsoil with that of the surface, and again there are many instances in which such would do more harm than good. The soil under discussion appears to be one fairly rich in the organic and inorganic elements of plant food. The surface soil, derived from the subsoil plus the remains of decayed plants, is richer, as might be expected, in organic matter and nitrogen; yet we find here these present in quantities equalling those possessed by many surface soils held to be fertile. It contains more lime, but less phosphoric acid and potash, than the soil resting upon it. These in the latter are probably more readily available for plant nutrition.

No. 4. A so-called alkali soil, forwarded by John C. Kinghorn, of Saltcoats, N.-W.T. A greyish-black soil, containing all the constituents necessary for plant growth, in good quantities. As before remarked alkali (*i.e.*, salts of soda) are not present in excess, and the cause of the trouble is not very evident.

No. 5. Also an alkali soil, from Geo. W. Stewart, Moosomin. A little darker, but otherwise very similar in appearance to No. 4. The absence of sulphuric acid and chlorine—save in traces—in a soil of this character, is worthy of remark. In lime and magnesia it is considerably lower than the preceding specimen, while in soda it possesses a like amount. In fertilizing constituents it is almost equal to the above subsoil.

No. 6. Sent by Wm. Walsh, Sharp Hill Creek, Calgary, N.-W.T. I consider that this should be a very fertile soil, provided that climatic influences are favourable The analytical data show it contains more than average quantities of the requisite elements of plant food.

No. 7. An alkali soil from 3 miles north of Brandon, Manitoba. Somewhat lighter in colour than Nos. 4 and 5. It is very low in potash and phosphoric acid, but of medium quality as regards nitrogen. It possesses sulphuric acid, chlorine, magnesia and soda in more marked quantities than the soils of this character already considered. The lime, if combined with the carbonic acid, would be equiva-

lent to 13·39 per cent of carbonate of lime, leaving the sulphuric acid and magnesia to form 3 per cent sulphate of magnesium or epsom salts.

It is gratifying to note that chemical analysis bears out very emphatically the impression that the soils of Manitoba and the North-West Territories generally are most fertile, and possess in abundance all those elements necessary to large crop yields.

No. 8. This sample and the four following were sent by Mr. G. S. Wilgress, B.A., barrister of Huntsville, Muskoka, a gentleman who is interesting himself in the agricultural welfare of that district. This soil is from the farm of Mr. Andrew Hart, lots 5 and 6, concession 6, township Sinclair. It is a loose, sandy loam and has never been cropped. The subsoil of hard pan is found at a depth of from 6 to 12 inches. The land was cleared about ten years ago. This is a very dry soil, containing little lime, and less than the average in potash. Phosphoric acid is present in fair quantities. It is only moderately rich in organic matter and nitrogen.

A heavy application of wood ashes, to supply potash, lime and phosphoric acid, would greatly benefit this soil. In the absence of barn yard manure, the turning in of some green crop—preferably clover, or if this will not grow, rye—would improve the absorptive and retentive qualities of this soil, and at the time supply available nitrogen.

Nos. 9 and 10. From lot 17, concession 4, township of Chaffey, the farm of Mr. James Down. Sandy loam, about 15 inches in depth, underlaid by hard pan. No. 10 is taken 12 inches below the surface. Soil was originally timbered with pine and other soft woods, together with maple and birch. It was burnt over five years ago, after which hazel, cherry and other small trees grew. The ground was cleared in 1890, and has never been manured. These soils were taken during a season of drought, and to this fact the low percentage of water may be largely attributed. While in no sense a calcareous soil it cannot be considered deficient in lime. The subsoil contains very much less than the surface soil. The potash, alike in quantities in both soils, is low. In phosphoric acid also they are below the average. The organic matter and nitrogen in No. 9 are lower than in the preceding sample. In the subsoil they are present to about one half the amount of those in the surface soil.

Nos. 11 and 12. From lot 23, concession 14, township of Franklin, the farm of Rev. R. N. Hill. Ground, originally timbered with mixed hardwoods and hemlock, has never been ploughed, but scuffled between the stumps. One crop of wheat, one of oats and two of hay have been taken off, but no manure applied.

The surface soil is a light-grey loam, somewhat clayey in texture. It is exceptionally high in potash* and fair in phosphoric acid, but very low in nitrogen. The sub-soil is very much poorer in the elements, nitrogen practically being absent. In both soils the lime is comparatively high for Muskoka soils.

The analytical work in this series is not yet quite completed, but from the data so far obtained the general character of the Muskoka soil appears to be light and sandy.

The addition of muck would greatly improve their tilth and at the same time add much nitrogenous plant food. As suggested when remarking upon No. 8, wood ashes plentifully supplied and the turning in of some green crop would materially enhance their fertility.

Nos. 13, 14 and 15 are from lot 11, concession 2, township of Russell, county Russell, the farm of Norman E. Otto.

No. 13, a virgin soil (uncultivated and unmanured) is a grey sandy loam with a fair proportion of nitrogen and phosphoric acid. The potash is low.

No. 14. Is a light yellowish sandy subsoil, containing little more than traces of organic matter and nitrogen.

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* The exceptional amount of potash (·58 per cent) in this specimen may possibly be due to the accidental presence of ashes produced in clearing the land.

No. 15. Cultivated surface soil, very similar in colour and texture to No. 13. The nitrogen and organic matter are somewhat lower than those of the virgin soil. In phosphoric acid it is deficient.

No. 16. A loam from Mr. Hiram Walker, Walkervile. A fair soil in composition, with the exception of phosphoric acid, which is low, and of lime in which it is particularly deficient.

No. 17. From J. N. Poirier, Victoriaville, Arthabaska County, P.Q. A sandy loam of fair quality, but rather low in mineral constituents.

No. 18. Subsoil to the above and very similar to it is the proportion of potash and phosphoric acid. For a subsoil it may be considered high in nitrogen.

No. 19. Also sent by Mr. Poirier. It is a black muck of average quality. As a soil it contains an abundance of nitrogen, though this is only slowly rendered assimilable, and a fair amount of phosphoric acid. In potash it is remarkably deficient. The best fertilizer to improve the composition of this soil is wood ashes, which contain from 4 per cent to 9 per cent of potash and about 2 per cent of phosphoric acid; leached ashes are very much poorer in potash. An application of from 60 bushels to 150 bushels to the acre of fresh ashes, according to the nature of the crop about to be grown, would give good results. The texture of this soil would be benefited by a heavy dressing of clay, sand or other inert matter.

No. 20. Subsoil, underlying the above. A greyish sandy soil, containing little potash, but fairly rich in nitrogen. Though not contributing much plant food, its admixture with the surface soil (No. 19) would very materially improve the latter by rendering it heavier.

No. 21. A pinkish red sand, containing very little organic matter and only traces of nitrogen. The amounts of the mineral constituents, including potash and phosphoric acid, are very small.

No. 22. A brownish red, sandy soil, considerably richer in organic matter and nitrogen than the preceding sample. It is rich in potash, though phosphoric acid is present only in small quantities.

Nos. 21 and 22 were from St. Adelaide de Pabos, P.Q., and were forwarded by the Rev. Joseph Dechamplain.

No. 23. A surface soil from the farm of A. S. Ross, Hansford, Cumberland County, N.S. A brown, sandy soil, very poor in nitrogen and phosphoric acid.

No. 24. Sent by John Gillis, South-west Mabou, N. S. A brown, sandy soil, having a fair amount of organic matter and nitrogen. It is comparatively high in potash and low in phosphoric acid. Lime is practically absent.

ANALYSES of Soils (Air-dried), 1891.

Number.	Soil.	Lacality.	Water.	Organic and Volatile Matter.	Clay and Sand.	Oxide of Iron and Alumina.	Lime.	Magnesia.	Potash.	Soda.	Phosphoric Acid.	Soluble Silica.	Sulphuric Acid.	Chlorine.	Carbonic Acid (undetermined.)	Total.	Nitrogen.	Clay.	Sand.
1	Surface.....	Ladner's Landing, B.C..	6·66	16·39	67·32	7·70	·47	·12	·49	...	·27	·02	......	....	·54	100·00	·576	21·55	45·77
2	do	Yorkton, N.W.T.	5·32	13·27	71·80	7·69	·06	·19	·46	...	·20	·09	......	....	·92	100·00	·477	11·56	60·24
3	Sub-soil	do	5·90	7·70	74·07	9·04	·71	1·45	·40	....	·09	·12	......	...	·52	100·00	·123	9·62	64·45
4	Surface.....	Saltcoats, N.W.T.	5·91	12·74	64·68	7·52	2·72	2·63	·32	·08	·20	·11	·17	·02	2·90	100·00	·538	14·03	50·65
5	do	Moosomin, N.W.T.	5·23	11·18	75·16	5·12	·90	·87	·29	·08	·11	·11	traces	....	·95	100·00	·454	15·13	60·03
6	do	Sharp Hill Creek, Calgary, N.W.T....	4·90	11·63	74·09	6·84	·88	·63	·42	....	·16	·17	......	....	·28	100·00	·425	9·69	64·40
7	do	3 miles north of Brandon, Man	4·07	8·55	61·63	6·00	7·48	2·77	·04	·32	·05	·09	2·08	·15	6·77	100·00	·281	4·91	56·72
8	do	Lots 5 and 6, Con. 6, Tp. of Sinclair, Muskoka, Ont	2·42	8·53	82·13	6·30	·10	·26	·11	....	·26	·07	...	....	......	100·18	·181	9·97	72·16
9	do	Lot 17, Con. 4, Tp. of Chaffey, Muskoka	1·53	6·69	85·60	4·98	·39	·31	·07	....	·10	·06	...	....	·27	100·00	·137	15·84	69·76
10	Sub-soil	do do ..	1·80	3·44	88·63	5·34	·19	·14	·08	....	·17	·22	......	....	.....	100·01	·073	11·90	76·73
11	Surface.....	Lot 23, Con, 14, Tp. of Franklin, Muskoka	5·79	5·95	72·62	13·22	·72	·08	·58	....	·17	15	...	....	·72	100·00	·097	13·70	58·92
12	Sub-soil	do do ..	7·26	3·44	74·64	12·88	·62	·23	·02	....	·08	·22	......	....	·61	100·00	traces	13·18	64·46
13	Surface.....	Lot 11, Con. 2, Tp. of Russell, Ont.....	3·58	6·06	85·65	3·62	·39	·37	·06	...	·21	·09	.....	....	....	100·03	·159	25·86	59·79
14	Sub-soil	do do	1·13	1·38	90·22	5·71	·58	·69	·14	...	·10	·04	.....	....	·01	100·00	·012	22·09	68·13
15	Surface.....	do do	4·89	4·88	84·03	4·86	·57	·49	·10	....	·09	·12	.....	....	....	100·03	·136	30·96	53·07
16	do	Walkerville, Ont.	1·55	6·39	83·35	8·10	·02	·66	·33	....	·12	·09	......	....	......	100·61	·233	11·16	72·19
17	do	Victoriaville, Arthabaska, Que........	7·85	8·00	77·20	5·87	·35	·02	·15	....	·16	·32	...	....	·08	100·00	·273	16·63	60·57
18	Sub-soil	do do	4·98	5·19	81·27	7·35	·28	·47	·16	....	·17	·16	......	....	....	100·03	·175	13·27	68·00
19	Surface.....	do do	16·65	71·64	3·14	1·78	4·22	·20	·04	....	·22	·29	......	....	1·82	100·00	1·355	......	..
20	Sub-soil	do do	4·09	5·95	82·18	6·13	·67	·03	·03	....	·31	·26	......	....	·35	100·00	·178	15·34	66·84
21	Surface.....	Ste. Adélaïde de Pabos, Que.....	·11	1·63	93·66	4·32	·06	·01	·06	....	·04	·05	......	....	·06	100·00	traces	12·28	81·38
22	do	do	2·32	7·67	83·17	5·99	·15	·14	·43	....	·07	·04	.	....	......	100·08	·210	1·87	81·30
23	do	Hansford, Cumberland, N.S.	1·36	3·32	90·87	3·97	·05	·17	·16	....	·06	·02	.....	...	·02	100·00	·089	15·13	75·74
24	do	South-West Mabou, N.S....	2·32	6·81	83·68	6·54	traces	·20	·36	....	·09	....	......	....	..	100·00	·207	35·86	47·82

PART II.

MUCKS, MUDS AND PEATS.

In previous reports I have taken occasion to point out and emphasize the value of this class of natural fertilizers; but on account of the importance of the subject, and in order to make the analytical data here given intelligible and easy of comprehension, I propose to again briefly discuss the origin, the uses or application, and the value of these substances.

Muck.—Every true muck consists largely of semi-decayed vegetable matter or humus—the accumulated remains of plants, chiefly aquatic, of many generations. These well-known deposits of swamp muck are the result, principally of the continuous action of water on the fresh and green vegetable matter, converting it into a uniform black or brown mass. The lack of structure in the matter deposited increases with decay. In the upper layers are to be found the roots of plants still growing on the surface, together with much undecomposed woody tissue. The lower portions of the muck deposits show, as a rule, but few roots, the process of decomposition having proceeded farther, destroying all structure. A black or brown material results, light as to weight and powdering easily when dry.

In some degree a measure of the value of a muck may be obtained from its colour, its structure, and the amount of ashes left when a small sample is burnt. A good muck should be dark brown or black, structureless (that is not full of undecayed woods and roots), light and easily powdered when dry, and should yield only a small quantity of light ashes when burnt.

As a supplier of plant food, muck is chiefly valuable for its nitrogen, contained in the organic matter or semi-decomposed plant remains. Under favourable circumstances it yields this nitrogen as food for farm crops.

But in addition to being a nitrogenous fertilizer, its application to many soils improves their tilth or mechanical texture. If a soil be too light or too heavy, the best results cannot be obtained, though all the elements of plant food be present. Muck has the effect of making heavy soils porous, allowing air and water to freely permeate and the roots to find an easy passage. For light and sandy soils and those poor in organic matter muck is most beneficial, improving their retentive powers for moisture and fertilizing elements. For rich soils that require lightening it forms a valuable and cheap substitute for barn-yard manure, on account of its bulk and lasting qualities.

By its further decomposition in the soil, carbonic acid gas is developed. This when dissolved in the soil-water assists in setting free mineral plant food hitherto in a condition unavailable and is probably of service in other ways. The germs of nitrification which render soluble and assimilable the nitrogen of muck, likewise convert and make soluble that in the nitrogen-holding substances in the soil, so that both the mineral and organic plant food of a soil are made more readily available for crops by the application of muck.

As might be supposed, all mucks are not equally valuable. Those which contain large amounts of clay and sand will be poor in organic matter and consequently in nitrogen. Again, as an inspection of the following table will show, the proportion of nitrogen in the organic matter of mucks is very variable. This is partly due to the nature of the vegetation from which the muck has been formed, partly to the degree of decay or fermentation that has taken place, and partly no doubt, in some instances, to a leaching action of the water on the soluble nitrogen-holding compounds. The colour of muck is not an invariable criterion as to its quality; many of a brown colour contain a larger percentage of nitrogen than black samples, which appears contrary to the generally accepted opinion.

Peat.—The difference between muck and peat is perhaps one more of degree than of kind. The vegetable matter of peat, usually present without admixture with clay and sand, has not decayed to the extent that it has in muck, and conse-

quently its nitrogen is not so available for plant food. Peat is composed largely of woody fibre, still undecomposed and still retaining its structure. Its derivation is not largely from aquatic plants, as in the case of muck, and its formation does not appear to have taken place with the presence of that large excess of water conducive to the development of swamp deposits. While not so valuable for immediate use, or as a compost, as muck, peat, by reason of its texture and absorbent qualities generally, offers itself as being particularly valuable for soaking up and retaining liquid manure.

MUDS.—River and lake muds are formed by the gradual deposition of silt. They consist largely of inert matter—very fine clay and sand—with variable amounts of animal and vegetable *débris*. As a rule their percentage of nitrogen is not large. Their fine mechanical condition, however, often enhances their value.

Mucks, peats and muds, without further fermentation or decay, do not readily give up their nitrogen to growing plants. If applied to a soil without this previous fermentation, the immediate result, except what may be due to improved tilth, will not be a large one. The process there is a slow one, the rapidity, however, depending on the nature of the soil, the amount of moisture, and the temperature. Favourable conditions are a fairly light soil, and damp, hot weather.

It is as a compost that the full benefit of mucks may be obtained. Such may be made by mixing it with barn-yard manure, wood ashes, dissolved bone or garden and house refuse, and allowing them to heat together. By this means the nitrogen becomes more and more soluble, and, therefore, of greater use for the plants.

As already stated, peat and muck are excellent absorbents for liquid manure in stables, cow houses, pig pens, &c. After being used for this purpose, and mixed with some of the more solid manure, the mass should be allowed to ferment in a heap, being from time to time turned over. In this way much fertilizing material that might go to waste is preserved, and by the addition of the nitrogen of the muck to that of the manure, a most valuable and rich fertilizer is obtained.

During the past year twenty-seven specimens of these fertilizers have been examined. They were obtained in the provinces of Ontario, Quebec, New Brunswick, Nova Scotia and Prince Edward Island.

They were accompanied by particulars as to source and amount of supply and a request for information as to their fertilizing qualities.

The following table gives the composition in full of the first five samples analysed. The results are calculated on the air-dried material.

Analyses of Muds and Mucks (Air-dried), 1891.

——	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
Water	4·24	23·69	18·19	7·79	2·43
Organic and volatile matter	17·78	36·44	64·86	57·37	9·39
Insoluble residue (clay and sand)	63·51	30·70	2·46	32·29	70·91
Oxide of iron and alumina	9·78	3·48	4·35	1·40	8·23
Lime	·30	2·63	4·99	·44	3·84
Magnesia	1·37	·38	·36	·24	·17
Potash	·12	·08	·23	·13	·58
Soda	....	....	....	....	·49
Phosphoric acid	·16	·30	·31	·22	·10
Soluble silica	·01	·30	·17	·11	·06
Sulphuric acid	2·66	....	....	....	....
Carbonic acid, &c. (undetermined)	·07	2·00	4·08	1·01	3·80
	100·00	100·00	100·00	100·00	100·00
Nitrogen (in organic matter)	·504	1·135	1·820	2·045	·332
Pounds of nitrogen in one ton of air-dried material.	10·	22·	36·	40·	6·

The following brief explanatory notes with regard to the above are added:

No. 1. Marsh mud, forwarded by the Pioneer Publishing Co., Summerside, P. E. I. This is not a rich fertilizer, but represents an average sample of marsh or river mud. In potash and phosphoric acid it is somewhat low. The percentage of nitrogen is a little higher than that usually found in marsh lands.

No. 2. Is a black muck from the east riding of Peterborough, Asphodel township, and sent by Mr. F. Birdsall. The 30 per cent of insoluble matter is chiefly sand, which gives to the whole a fine loamy texture. The air-dried substance contains over 1 per cent nitrogen, or 22$\frac{3}{4}$ lbs. to the ton, making a valuable nitrogenous fertilizer. It also contains over 4 per cent of carbonate of lime, a very useful material for many soils. Mr. Birdsall reports very good results from its use, and thinks it equal to barnyard manure sometimes found.

No. 3. A black muck from a cedar swamp, South Orillia. Depth of deposit, 3 feet to 6 feet, with a subsoil of quicksand. The swamp, partially burnt over, contains about 150 acres. The sample analysed is from the deposit on the farm of Mr. R. Lehmann, South Orillia. This may be considered a first-class muck. It possesses nearly 2 per cent of nitrogen (40 lbs. to the ton) and 9 per cent of carbonate of lime. The small quantity of inert, insoluble matter, is noticeable. In potash and phosphoric acid, it is a good average sample.

No. 4. Forwarded by Mr. Bayard Williams, of Long Reach, King's county, N.B.; obtained from the bottom of a lake. It partakes very much of the nature of a swamp muck, possessing over 40 lbs. of nitrogen to the ton. It should prove, both from its composition and texture, a valuable nitrogenous manure.

No. 5. A river mud from Lower Montague, P.E.I., sent by Mr. H. P. Robertson. The analysis shows it to be rather of the nature of a good soil than a manure.

It was found that time would not permit to make a complete analysis of all the samples that were sent in for examination. It was therefore determined to estimate only their most important constituents. Their relative values as suppliers of nitrogen is brought out in the subjoined table, which also affords further information regarding their constitution.

ANALYSES of Mucks, Muds and Peats (Air-dried), 1891.

No.	Nature of Material.	Locality.	Sender.	Nitrogen per cent.	Organic and Volatile Matter.	Sand and Clay.	Mineral Matter Soluble in Acid.	Water.	Pounds of Nitrogen in One Ton of the Air-dried Material.
6	Swamp or black muck...	Lot 21, Con. 3, Tp. Edwardsburg, Grenville Co., Ont.	J. Newman	2·605	74·99	5·35	8·94	10·72	52·
7	do do	Musselburg, Perth Co., Ont.	David Gascho	1·960	59·97	17·19	11·10	11·74	39·
8	do do	Kinmount, Victoria Co., Ont.	Henry Coben.	1·620	67·28	1·69	10·81	20·22	33·
9	do do	do do	do	1·812	61·47	1·97	13·52	23·04	36·
10	do do	Almonte, Lanark Co., Ont	W. B. Munro	1·630	50·57	28·06	9·84	11·53	32·
11	do do	St. Adelaide de Pabos, Gaspé, P.Q.	Rev. Jos. Dechamplain	2·300	68·68	8·13	13·16	10·03	46·
12	do do	do do	do	1·615	66·33	9·57	5·85	18·25	32·
13	do do	Hatley, Stanstead, P.Q.	G. H. Burrage	2·315	72·54	3·73	9·64	14·09	46·
14	do do	do do	do	1·425	68·69	1·27	9·97	20·00	28·
15	do do	Chatham, Northumberland, N.B.	Hon. J. B. Snowball	1·170	53·38	1·40	5·24	39·98	23·
16	do do	Long Reach, King's Co., N.B.	Bayard Williams	1·525	88·16	·38	2·98	8·48	30·
17	do do	South-West Mabou, N.S.	John Gillis	1·830	53·44	4·51	11·84	30·21	36·
18	do do	Bayfield, N.S.	Percy Randall	2·650	72·12	6·94	8·46	12·48	53·
19	do do	Lower Freetown, P.E.I.	Joseph Taylor	·985	85·26	2·89	·90	10·95	20·
20	do do	Roseneath, Cardigan, P.E.I.	Thos. J. Donahoe.	1·665	86·20	1·78	1·34	10·68	33·
21	do do	do do	do	·615	88·32	1·65	·95	9·08	12·
22	do do	Georgetown, P.E.I.	F. G. Bovyer	·879	86·57	·80	1·08	11·55	17·
23	Mud (?)	Pownal, P.E.I.	A. M. McRae	1·520	49·30	15·64	8·40	16·66	30·
24	Mussel mud	Lot 14, Grand River, P.E.I.	Geo. Monkley	·161	6·35	49·67	42·44	1·54	3·
25	Lake mud	Hansford, Cumberland Co., N.S.	A. S. Ross	·803	23·79	55·24	12·57	8·40	16·
26	Salt mud	Five Islands, N.S.	C. A. McBurnier	·079	5·23	76·73	15·19	2·85	1·
27	Peat	Tp. Asphodel, Peterboro' Co., Ont.	F. Birdsall.	1·295	76·32	1·51	7·45	14·72	26·

A brief description of each sample is here appended :

No. 6. A muck rich in organic matter and nitrogen, with little inert matter, clay and sand. As this was intended for use as a litter, the value of the resulting manure would be materially increased, owing to the additional nitrogen supplied by the muck.

No. 7. Very similar in appearance to the preceding sample, but contains only three-quarters the amount of nitrogen. Nevertheless, it is above the average in this important element.

Nos. 8 and 9. These specimens of swamp muck were taken from the surface (No. 8) and from 2 feet below (No. 9). They differ much in appearance. No. 8 shows a considerable amount of undecomposed woody tissue and is less granular than No. 9. Their analysis proves them to be very similar in composition.

No. 10. A powdery, loamy muck of brown colour, containing nearly 30 per cent of sand. It possesses about the average quantity of nitrogen found in fair samples.

Nos. 11 and 12. These are similar in the percentages of organic matter and insoluble residue they contain. The organic matter of No. 11 is not as rich in nitrogen and not as well decomposed as that of No. 12.

Nos. 13 and 14. These are from extensive deposits lying near each other. No. 13 is much darker and somewhat less woody and more granular than No. 14. Its value is considerably the higher of the two.

No. 15. As this was analysed when it contained nearly 40 per cent of water, it appeared to possess less nitrogen than many others which are really of less value. Calculated on the basis of 10 per cent of water, this sample would yield 35 lbs. of nitrogen to the ton. It may be considered a very fair average sample of black muck.

No. 16. Light brown in colour. Considering its small percentage of water, it must be regarded as low in nitrogen.

No. 17. Apparently well decomposed, black, and of good texture. If dried to 10 per cent of water it would contain 47 lbs. of nitrogen to the ton, which is considerably above the average.

No. 18. From a very large deposit. This muck contains the largest amount of nitrogen received during the past year. Evidently a very valuable nitrogenous fertilizer.

No. 19. A reddish brown sample. Although containing 85 per cent of organic matter, it yields only 20 lbs. of nitrogen to the ton.

No 20. Although very fibrous, it possesses an average amount of nitrogen. It would do good service as an absorbent in stables.

No. 21. Taken from 4 feet below the surface, fairly dark and granular, but notwithstanding is very poor in nitrogen.

No. 22. A dark brown muck, considerably below the average in nitrogen.

No. 23. Sent as a sample of "mud," but evidently more of the nature of a swamp muck. Of a dark gray colour and somewhat sandy. A fair sample, slightly below the average quality.

No. 24. "Mussel mud." Consisted principally of the unbroken and undecomposed shells of mussels embedded in clay. It cannot be considered a nitrogenous fertilizer, but is of value to soils deficient in lime. The use and value of these mussel muds have been treated of at some length in former reports.

No. 25. "Lake mud." Not a rich fertilizer compared with swamp muck. Insoluble matter is over 50 per cent, and organic matter less than 25 per cent.

No. 26. "Salt mud." Exceedingly poor in nitrogen, consisting largely of insoluble residue. Is a reddish, compact, very earthy substance.

No. 27. A peat. A valuable material for bedding, owing to its texture and richness in nitrogen.

A considerable variation in the composition, and hence in the value of these specimens, is to be noticed. The twenty-four samples of black muck give an average of 33 lb. of nitrogen to the ton. Nitrogen is the most costly of the three important fertilizing elements generally found necessary to return to the soil. Its value may

be said to vary from 18 cents per pound in salts of ammonia and nitrates to 5 cents per pound in wool waste, hair, &c. Although these may be considered trade values, yet in a great measure they represent their relative worth to the farmer. The nitrogen in the first-named articles is immediately available, whereas in hair, wool and the like, a fermentation process must ensue, continuing over a considerable length of time, before the nitrogen is converted into such a soluble condition that plants can make use of it. Mucks rank with the latter rather than with the former class, as fermentation is necessary to obtain its full benefit. If the nitrogen in muck be assigned an average value of 7 cents per pound (the degree of fermentation or decay that has taken place will affect its worth for present results), one ton of the material containing 33 lbs. of nitrogen would be worth $2.31, and a sample possessing 50 lbs. to the ton, $3.50. It is plain, therefore, that a valuable nitrogenous fertilizer is to be found in the deposit of many of our swamps.

EEL GRASS (*Zostera marina*).

A sample of this material has been received from Mr. William Mackay, of Haliburton Bridge, Pictou, Nova Scotia, who writes that it grows in immense quantities in all the harbours and shallow bays on the north shore of Nova Scotia and New Brunswick. He further says that it is generally supposed to be useless as a manure and allowed to go to waste, excepting small quantities used for banking houses in the autumn. If the dry substance contained 1 per cent of nitrogen, Mr. Mackay thought it would be worth hauling.

The material as received had been dried with a gentle heat. Its analysis furnished the following figures :—

	Per cent.
Total ash, or mineral matter	21·90
Phosphoric acid (in ash, 1·80 per cent)	0·41
Potash (in ash, 13·28 per cent)	2·90
Nitrogen, in organic matter	1·24

If without great expense this substance can be procured—preferably of course in the dry condition—I consider it would prove a valuable fertilizer. It contains notable quantities of the three chief constituents of plant food—potash, phosphoric acid and nitrogen. Before application to the soil it should be fermented. In its dry, hard condition it might lie in the soil undecomposed for a very long time. If suitable for bedding, this manner of use would be most profitable; but in any case it should be first mixed with some material that would cause its decay. In this process of composting the elements of plant food are set free in an easily assimilable form.

SPENT TAN BARK.

This was also forwarded by Mr. Mackay, who stated that a tannery in the neighbourhood ran 4,000 to 5,000 tons of the substance annually into a cove, as worthless. It is hemlock bark after the "tan" has been extracted, and is essentially woody fibre. On analysis it was found to possess ·167 per cent of nitrogen. As a fertilizer, I am of the opinion that this material is almost valueless. It contains very little plant food, and is of a nature that would enable it for a long time to resist decay.

AMMONIACAL GAS LIQUOR.

In the destructive distillation of coal for the manufacture of illuminating gas a number of bye-products are formed, prominent among which is the so-called ammoniacal liquor. It contains varying amounts of ammonia (according to the nature of coal used and the process of condensation and purification in vogue), and also of certain other tarry and volatile substances.

Viewing it as a fertilizer, we may consider it as a dilute solution of ammonia containing certain impurities more or less harmful to vegetation—notably sulphur compounds.

For the purpose of concentrating and fixing the valuable constituent, ammonia, and in order to get rid of the poisonous products, it is submitted to distillation, the ammonia being collected in sulphuric acid. In this way ammonium sulphate is formed, a salt largely used in artificial fertilizers.

The direct application of the ammoniacal liquor to the soil can only be used with safety after careful experiment and previous dilution. It is impossible to give definite instruction with regard to the extent of the dilution that should be practised, owing to the fact that the liquor varies in strength and amount of impurities in different samples. Some persons have found injurious effects from it when diluted to twelve times its volume, while others have used it with safety and profit upon the addition of three times its bulk of water only.

When not distilled, this gas liquor is usually allowed to run to waste. Containing as a rule somewhat under 1 per cent of ammonia, it scarcely pays to transport it any great distance. The question, however, has arisen, whether the liquor could not be used with advantage by the agriculturists in the neighbourhood of its production. Large watering carts have been suggested for distributing it on the land, and also the plan of adding sufficient sulphuric acid to the liquor to fix the volatile ammonia—present chiefly as the volatile carbonate—before application. It may be possible by suitable treatment to produce a valuable fertilizer without the expense of distillation. The details and cost, however, have yet to be worked out to arrive at an economical process. It may be found that upon neutralizing of the liquor with sulphuric acid and allowing it to stand for three or four days the volatile poisonous compounds are largely evolved, the tarry matter deposited and the ammonia retained. If such a simple method worked satisfactorily, the resulting liquor might be diluted in the fields to the proper degree, and at once applied to the soil. Again, ground gypsum added to the crude liquor would have the effect of retaining the ammonia in the liquid, the tarry matter being deposited with the carbonate of lime formed.

At the request of the Hon. J. B. Snowball, Chatham, N.B., a sample of ammoniacal liquor has been examined. The analysis showed that 14 gallons contained 1 lb. ammonia (NH_3). Every gallon of this liquor would produce 4 ozs. of ammonium sulphate. It contained therefore a little less than 1 per cent of ammonia. Nitrogen in artificial fertilizer costs about 17 cents per pound. This liquor therefore contains one cent's worth of nitrogen per gallon. If an opportunity presents itself, it is proposed to make some experiments with the material during the coming year at the Farm laboratories.

Sulphate of ammonia, while not a complete manure for plants, is an exceedingly valuable one for supplying nitrogen. It acts rapidly in the soil on account of its extreme solubility. In conjunction with other elements of plant food it usually gives most gratifying results—especially upon worn-out soils.

PART III.

FODDERS.

The desirability of our farmers having information regarding the relative value of cattle foods, as derived from chemical analysis, has led to a continuation of the work commenced and reported upon last year.

The laboratory investigations of the past season in this connection have been confined almost exclusively to the examination of roots and fodder corn.

Roots.

Roots form an important ingredient in cattle rations, and are largely grown to supply during the winter months succulent and palatable food.

In no sense can they be considered concentrated food, for they contain a very large percentage of water, and the "dry matter" is not rich in albuminoids; but owing to their easy and entire digestibility, their succulent nature, and what we may term medicinal properties, they have been found exceedingly valuable for keeping up the milk flow and in preserving a healthy tone to the digestive organs of the cow. The dry matter (or real cattle food) of roots is essentially non-nitrogenous. Their "nutritive ratio," or proportion of digestible albuminoids to digestible non-nitrogenous portion, is wide, and varies from 1 : 8 to 1 : 13. For this reason, together with the fact that the dry matter is only from 170 lbs. to 190 lbs. per ton, roots cannot be fed exclusively. Their use should be supplemented with a coarse or bulky fodder—for the proper distention of the ruminating apparatus—and also with a judicious quantity of a concentrated food, such as bran, oil cake or other meal to supply albuminoids. In this way a properly balanced and economical ration may be prepared.

The samples analysed were as follows:—Carrots, 3 varieties; turnips, 2 varieties; mangels, 3 varieties, and of sugar-beets 4 varieties. They were grown on the Central Experimental Farm during 1891. The roots examined were typical examples of fine specimens of each variety. They had been preserved as such, and not selected for analytical purposes. It is generally admitted, and confirmed by analysis, that the increased development in large roots is accompanied by a decrease in the percentage of dry matter—that is, the larger roots are the more watery, as a rule. On this account the percentage of water found in those examined is probably somewhat higher than it is in the average-size root. Three or more roots of each variety served to furnish the material from which the samples for analysis was taken.

In my report for 1890 I gave a brief account of the composition, value and function of fodder constituents, to which I would refer the reader for an explanation of the terms used in the following tables :

Carrots.—Three leading varieties were analysed, and their comparative value is brought out by the figures that denote the amount of digestible matter per ton in the above table. Though very close, the Ox-heart gave results which show it to be slightly richer in food constituents than the Short White or the Belgian carrots.

Turnips.—The Purple-top Swede, according to our analyses, is more valuable than the Greystone turnip.

Mangels.—The Golden Flesh, Golden Tankard and Mammoth Long Red mangels form the next group examined. No great amount of difference in composition is noticeable between these varieties. They are second to carrots in feeding value, weight for weight.

Sugar-beets.—The interest that has been awakened throughout Ontario and Quebec lately in the growing of sugar-beets for the purpose of manufacturing sugar has made it advisable to ascertain the value of this crop as fodder, compared with that of other roots. Analyses of four principal varieties have been made and the results tabulated. They show that sugar-beets are the most nutritious of all roots, containing about one-half more dry matter than carrots, mangels and turnips. Much of this dry matter consists of sugar, easily digested and assimilated, and of considerable

value as a food. The culture of sugar-beets when grown for fodder purposes differs from that of those raised for the sugar factory. As a fodder crop the plants should not be so close together in the row, nor is there any necessity to earth them up, as in the case of factory beets. The yield per acre, in this way, will be considerably increased.

Sugar-beet Pulp.—This is a bye-product in the manufacture of sugar from beets, and consists of the residue after the extraction of the sugar by diffusion. The very large percentage of water (95·72 per cent) causes the fresh material to be of very little value. If pressed, however, until it contained 20 per cent of solid matter and then converted into ensilage, a useful fodder results.

Fodder Corn.—For the sake of comparison I have inserted the average composition of 7 varieties of Indian corn fodder at different stages of development—particulars of which appeared in Bulletin No. 12, issued in June last. The analyses of two samples of ensilage are also added. These latter show that there may exist a wide variation in the value of ensilage, depending chiefly on the degree of maturity of the fodder ensiled and the care with which it is preserved. If the corn possess a large percentage of water when put in the silo and the air not thoroughly excluded, the ensilage will be poor in quality. Further remarks on this important fodder crop will be found in a special chapter devoted to the results of our experiments of the past three years.

Screenings.—These samples consist of small wheat, weed seeds, chaff, broken straw, &c., winnowed out in the cleaning of the wheat before grinding.

Mr. Fletcher, Dominion Botanist, to whom was submitted a sample, makes the following report as to its botanical composition:—

	Per cent.
Small and broken wheat, chaff, straw, &c..	30·0
Seed of the wild buckwheat (*Polygonum convolvulus*)	29·2
Seed of the lamb's quarter (*Chenopodium album*)............	33·3
Stinking smut..	6·0
Seeds of wild sunflower....................................	1·5

It is impossible to arrive at the actual feeding value of the screenings from analyses alone, as the digestibility must be taken into account, concerning which I have no data. However, an approximation to its relative value may be ascertained by comparing its composition with that of other fodder articles. I therefore subjoin the following :—

Fodder.	Albuminoids.	Fat.	Carbo-hydrates.
	Per cent.	Per cent.	Per cent.
Linseed meal	32 to 38	5 to 7	40 to 45
Wheat bran....................................	17 to 20	2 to 6	55 to 62
Good hay	8 to 15	1·5 to 2	50 to 55
Corn meal	10 to 15	3 to 5·5	73 to 83
Pea do	20	1·5	55
Screenings Nos. 1 and 2..........................	13·5 to 14·5	2·75 to 3	56 to 65

The screenings are finely ground, so that the material sold is in the form of meal. I have no information regarding any effect on the cow's digestion or general health by the substitution of this for other meals in the ration.

The following instructive table, besides giving the amounts of water and dry matter in the fodders already discussed, shows the percentages of food constituents in the solid matter, thereby allowing a comparison to be made of the value of the fodders after deducting the amount of water they contain. It also states the quantity of dry matter (practically all digestible in the case of roots) in one ton of the fodders.

Analyses of Fodders, 1891.

Fodder.	Manufacturer, Grower or Sender.	Water.	Albuminoids.	Fat.	Carbo-hydrates.	Fibre.	Ash.	Pounds of Digestible Matter in a ton (2,000 lbs.): Albuminoids.	Fat.	Carbo-hydrates.	Fibre.	Total.	Nutritive Ratio.
Carrot, Ox-heart, Short Red (Steele)	C. E. **Farm**	90·17	·66	·01	7·36	·97	·83	13.2	·2	147·2	19·4	180·0	1:12·6
do Short White (Steele)	do	90·79	·77	·03	6·66	·86	·89	15·4	·6	133·2	17·2	166·4	1:9·8
do Giant White Belgian (Sutton)	do	90·51	·77	·02	6·78	·97	·95	15·4	·4	135·6	19·4	170·8	1:10·1
Turnip, Greystone	do	90·95	·66	·06	6·41	1·19	·73	13·2	1·2	128·2	23·8	166·4	1:11·7
do Purple-top Swede	do	89·74	1·40	·04	6·75	1·40	·67	28·0	·8	135·0	28·0	191·8	1:6·0
Mangel, Golden	do	90·56	1·10	.03	6·42	·84	1·05	22·0	·6	128·4	16·8	167·8	1:6·7
do Golden Tankard	Hon. Chas. Peloquin	91 90	·78	·03	5·62	·63	·84	15·6	·6	112·4	12·7	141·3	1:8·1
do Mammoth Long Red	C. E. Farm	91·41	·96	·02	5·73	·81	1·07	19·2	·4	114·6	16·2	150·4	1:6·8
Sugar-beet, Vilmorin Improved	do	84·89	1·35	·06	11·84	·99	·87	27·0	1·2	236·8	19·8	284·8	1:9·6
do Klein Wanzleben	do	83·09	1·42	·06	13·27	1·19	·97	28·4	1·2	265·4	23·8	318·8	1:10·3
do Musy "C.H."	do	85·09	1·52	·04	11·25	1·12	·98	30·4	·8	225·0	22·4	278·6	1:8·1
do Krüger	do	83·88	1·70	·04	12·21	1·19	·98	34·0	·8	244·2	23·8	302·8	1:8·0
Sugar-beet "pulp"	Factory, Farnham, Que	95·72	·51	·01	2·36	1·26	·14	10·2	·2	47·2	25·2	82·8	1:7·1
Indian corn, average of 7 varieties, "silking and early milk stage"	C. E. Farm	80·76	1·76	·21	10·70	5·19	1·38	25·6	3·1	143·9	77·2	249·8	1:9·0
do average of 7 varieties, "late milk stage"	do	77·25	1·81	·34	13·10	6·22	1·21	27·4	5·0	175·8	89·7	297·7	1:10·4
do ensilage	do	78·00	2·07	·96	11·41	6·25	1·31	30·3	14·4	152·8	89·9	287·4	1:9·2
do do "Crosby Early"	J. Drummond, Petite Côte, P.Q.	80·63	1·84	·83	9·94	4·30	2·45	26·9	12·4	133·2	61·9	234·4	1:8·4
Screenings, No. 1	Lake of the Woods Milling Co., Keewatin	7·17	14·56	3·09	56·47	14·71	4·00	......	......	......	......	......	......
do No. 2	do do do	7·35	13·44	2·72	65·39	8·55	2·55	......	......	......	......	......	......

Fodders: Composition and Amount of Dry Matter per Ton.

Fodder.	Manufacturer, Grower or Sender.	Water.	Dry Matter.	Composition of Dry Matter.					Dry Matter per ton, in Pounds.
				Albuminoids.	Fat.	Carbohydrates.	Fibre.	Ash	
		Per cent.	Per cent.	Per cent.	Per cent	Per cent.	Per cent.	Per cent.	
Carrots, Ox-heart	Central Experimental Farm	90·17	9·83	6·72	·10	74·87	9·87	8·44	196·6
do Short White	do do	90·79	9·21	8·36	·33	72·31	9·34	9·66	184·2
do Giant White Belgian	do do	90·51	9·49	8·12	·21	71·44	10·22	10·01	189·8
do average, 3 varieties	do do	90·49	9·51	7·73	·21	72·88	9·81	9.37	190·2
Turnips, Greystone	do do	90·95	9·05	7·29	.66	70·83	13·15	8 07	181·0
do Purple-top Swede	do do	89·74	10·26	13·64	·39	65·79	13·65	6·53	205·2
do average, 2 varieties	do do	90·34	9·66	10·47	·52	68·31	13·40	7·30	193·2
Mangels, Golden	do do	90·56	9·44	11·65	·32	68·01	8 90	11·12	188·8
do Golden Tankard	St. Hyacinthe	91·90	8·10	9·66	·26	71·89	7·83	10·42	162·0
do Mammoth Long Red	Central Experimental Farm	91·41	8·59	11·17	·23	66·71	9·43	12·46	171·8
do average, 3 varieties	do do	91·29	8·71	10·83	·28	68·06	8·72	11·33	174·2
Sugar-beet, Vilmorin's Improved	do do	84·89	15·19	8·94	·40	78·35	6·55	5·76	303·8
do Klein Wanzleben	do do	83·09	16·91	8·40	·34	78·48	7·04	5·74	338·2
do Musy "C. H"	do do	85·09	14·91	10·20	·27	75·45	7·51	6·57	298·2
do Krügers	do do	83·88	16·12	10·55	·25	75·74	7·38	6·08	322·4
Average 4 varieties	do do	84·24	15·76	9·52	·31	77·01	7·12	6·04	315·2
Sugar-beet, pulp	Factory, Farnham, Que	95·72	4·28	11·91	·23	55·14	29·44	3·27	85·6
Fodder corn, glazing, average	Central Experimental Farm	73·82	26·18	....	....	....	....	....	523·6

Fodder Corn.

The results of the field experiments and analyses with this important crop made during 1889 and 1890 were issued in June last in bulletin form. From the analytical data then given I was enabled to draw the following conclusions:—

1. That the corn plant increases in value, by the storing up of digestible dry matter, until the kernel begins to glaze. If left uncut after this period the fibre becomes more indigestible and the percentage of albuminoids is somewhat lessened, and consequently the food value is lowered.

2. That the dry matter in different varieties of fodder corn, taken at the same stage of growth, is very similar in composition.

3. That it is during the early part of the season that the corn plant takes from the soil the larger portion of the mineral or ash constituents it requires; and also that the albuminoids (whose chief constituent is nitrogen) are principally formed in the tissues while the plant is yet young.

EXPERIMENTS OF THE PAST SEASON.

Further work, both in the field and laboratory, has been done during the past season towards obtaining fuller information regarding the growth of the corn plant.

The varieties experimented with were Longfellow, Pearce's Prolific, Thoroughbred White Flint and Red Cob Ensilage. These were sown in drills 3 feet apart, in fairly rich, loose soil. The latter had been well tilled, and it received a thorough cultivation during the growth of the crop.

Samples of each variety, consisting of 200 feet of one row, were cut at the following stages of growth: Tasselling, silking, early milk, late milk and glazing. The fodder was carefully weighed and a representative portion analysed. By these means the yield per acre and the nutritive value of the fodder at the different periods of development were obtained.

The following are the percentages of water and dry matter in the fodder corn:—

Amount of Water and Dry Matter in certain varieties of Fodder Corn at different stages of Growth, 1891.

Variety.	Stage of Growth.	Date.	Percentage of Water.	Percentage of Dry Matter.
Longfellow	Tasselling	Aug. 1	86·87	13·13
	Silking	do 11	86·02	13·98
	Early milk	do 27	82·84	17·16
	Late milk	Sept. 10	77·51	22·49
	Glazing	do 21	75·28	24·72
Pearce's Prolific	Tasselling	Aug. 3	84·52	15·48
	Silking	do 13	84·91	15·09
	Early milk	do 29	81·90	18·10
	Late milk	Sept. 12	79·00	21·00
	Glazing	do 22	72·36	27·64
Thoroughbred White Flint	Tasselling	Aug. 18	85·84	14·16
	Silking	do 25	85·27	14·73
	Early milk	Sept. 22	81·42	18·58
	Late milk	Oct. 3	77·07	22·93
Red Cob Ensilage	Tasselling	Aug. 22	85·68	14·32
	Silking	Sept. 2	79·14	20·86
	Early milk	Oct. 3	76·06	23·94

Averaging these results we obtain the figures in the subjoined table, where also are to be found the yield per acre, and the amount of dry matter in one ton of the fodder and the weight produced per acre at different periods in the life of the corn plant.

COMPOSITION, Yield per acre and Dry Matter per ton and per acre, 1891.

(Average of four varieties of Fodder Corn.)

Stage of Growth.	Percentage of Water.	Percentage of Dry Matter.	Yield per Acre.		Dry Matter.		
					Per Ton.	Per Acre.	
			Tons.	lbs.	Lbs.	Tons.	lbs.
Tasselling	85·73	14·27	22	1,329	285	3	468
Silking	83·83	16·17	24	52	323	3	1,770
Early milk	80·05	19·95	22	1,806	399	4	1,138
Late milk	77·86	22·14	21	759	443	4	1,467
Glazing	73·82	26·18	21	1,154	524	5	1,298

An examination of these figures shows most clearly the great gain to be obtained in nutritive value by allowing the corn plant to grow till the kernel glazes before cutting, whether it be intended for the silo or for preservation in the dry condition. In these experiments the increase of food material in the corn between tasselling and glazing amounted to about 75 per cent.

The value of this crop for producing cheaply a large quantity of palatable food has now become widely recognized. Sweet ensilage is now acknowledged as a valuable ingredient in the ration of cattle, both for milk and flesh production. The convenience in having a large supply of coarse fodder in a small compass renders the silo exceedingly useful to the farmer, stock-raiser and dairyman. By its means, food may be preserved in a succulent condition for use during the winter months.

The following suggestions, based on the results of the experiments of the last three seasons, are offered to those growing this valuable fodder crop:—

1. The tillage of the soil should be as thorough as possible, in order to allow the roots to freely penetrate the soil. The ploughing should be well done. The corn plant is one that readily responds to a rich soil. It will, therefore, be good practice to have it in a good mechanical condition and to give it a liberal application of manure.

2. Plant in drills or in hills. Sowing broadcast should be abandoned, as a great loss of cattle food per acre ensues from this course. The drills should never be less than three feet apart, and with most varieties as large a yield will be obtained if the distance be three and a-half feet. This plant requires plenty of room to properly develop and mature. It is mistaken economy to sow too thickly; 18 lbs. to 20 lbs. of seed per acre will give the best results. Essentials for rapid and generous growth are sunlight and air. When the rows are too close or too thickly seeded the plants are stunted and undeveloped, and the crop is not as suitable for preservation. It should be remembered that it is by the agency of sunlight that the leaves are able to appropriate the carbonic acid of the air—the source of all the carbonaceous food material formed in the plant.

3. Only varieties should be sown that yield a heavy crop and come to the glazing condition of growth before there is danger of damage by frost. Pearce's

Prolific, Longfellow and Thoroughbred White Flint are excellent for many localities. There are, however, other sorts which yield good results. Care should be taken to ascertain before purchasing seed if the variety is a heavy cropper and will come to maturity in the climate of the grower.

4. Begin cultivating early and keep the crop free from weeds. As the plants grow, restrict the cultivating more and more to the centre of the rows, otherwise there is a danger of cutting the principal roots which feed the plant.

5. Harvesting should be commenced when the kernel begins to glaze. The stalks at this time are beginning to turn yellow near the ground. If allowed to remain standing after this period the digestibility of the fodder may be impaired. If intended for the silo, and the weather permits, it should be left to wilt for two or three days after cutting. Sweeter ensilage results as a rule by this method than by at once drawing in and filling the silo.

SUGAR BEETS.

Sixty-four samples of sugar beets have been examined and are now reported on. Forty-five of these were grown on the Central Experimental Farm and nineteen were received for analysis from various localities in the Dominion.

The analyses of twenty-one samples grown on the Experimental Farm, Ottawa, from seed supplied by Wilfrid Skaife, Esq., of Montreal, afford the following averages:—

Percentage of sugar in juice............................	14·0 per cent.
Coefficient of purity..	83·3 do
Average weight of one root..................................	14 oz.

The seed is a cross between the varieties Klein Wanzleben and Vilmorin's Improved, and is known as "Krüger's" seed.

The ground had been well prepared and the roots were kept earthed up. The season was not a very good one for this crop, being too dry during the early part of the summer and too wet when the beets were ripening. Taking this into consideration, the average of 14 per cent of sugar is not low, and compares well with that obtained in the western States, where the crop is grown for manufacturing purposes. The coefficient of purity (or percentage of sugar in the solid matter) stands sufficiently high to make extraction of the sugar easy. The variation between the samples in sugar content is on the whole very slight.

Experiments with "Earthing."—The second series of experiments with sugar beets consisted in the analysis of 24 samples, including 12 well-known varieties. As explained in the following table, twelve samples (one of each variety) were kept thoroughly earthed while growing, while the remaining twelve were allowed to protrude above the surface of the ground. The averages of these show that the earthed samples were in every way superior to those unearthed, containing over two per cent more sugar, a higher coefficient of purity and a smaller weight. These results point to the value of the suggestions made last year for the culture of this crop. In eleven instances out of the twelve, the earthed roots gave a greater percentage of sugar than the unearthed. The analysis in each case was made from at least six roots. The maximum percentage of sugar was 16·3 and the minimum 5·5, and the average of the 24 samples was 12 per cent. Other data are given in detail in tabular form.

ANALYSES OF

EARTHED AND

No.	Grower.	Locality.	Variety.	Date of Sowing.
22	Central Experimental Farm......	Ottawa.......	"Krüger's Seed"	May 11...
23	do do	do	do	do 11...
24	do do	do	"Vilmorin's No. 1"...................	do 11...
25	do do	do	do	do 11...
26	do do	do	"Vilmorin's No. 2"...................	do 11...
27	do do	do	do	do 11...
28	do do	do	"Vilmorin's Green-top Brabant".......	do 11...
29	do do	do	do do	do 11...
30	do do	do	"Vilmorin's Improved"..............	do 11...
31	do do	do	do	do 11...
32	do do	do	"Vilmorin's Yellow Giant"	do 11...
33	do do	do	do do	do 11...
34	do do	do	"Original Klein-Wanzleben"	do 11...
35	do do	do	do do	do 11...
36	do do	do	Musy "C. H"................	do 11...
37	do do	do	do	do 11...
38	do do	do	Musy "B. D"	do 11...
39	do do	do	do	do 11...
40	do do	do	Musy "I. B"....	do 11...
41	do do	do	do	do 11...
42	do do	do	Bulteau Desprez, U.S. Dept. Agriculture	do 11...
43	do do	do	do do ..	do 11...
44	do do	do	Dippe's Klein Wanzleben	do 11...
45	do do	do	do do	do 11...
			Average of 12 varieties, earthed....	....
			do 12 do unearthed	....

SUGAR BEETS, 1891.

UNEARTHED PLOTS.

Date of Pulling.	Percentage of Sugar in Juice.	Coefficient of Purity.	Average Weight of one Root. Lbs.	ozs.	Nature of Soil and Fertilizer.	Remarks on Culture.
Oct. 7......	14·0	81·4	1	9	Manured in autumn, 1890........	Earthed.
do 7.....	12·7	82·7	1	1	do do	Unearthed.
do 7......	10·8	77·5	1	1	do do	Earthed.
do 7.	8·5	70·0	2	3	do do	Unearthed.
do 7.....	12·0	78·8	......	12	do do	Earthed.
do 7.....	10·3	76·7	1	12	do do	Unearthed.
do 7.	16·3	83·4	......	14	do do	Earthed.
do 7.	10·1	77·5	2	6	do do	Unearthed.
do 7......	14·4	84·5	. ....	11	do do	Earthed.
do 7	13·2	82·4	1	2	do do	Unearthed.
do 7.....	8·6	73·5	.. ..	11	do do	Earthed.
do 7.. ...	5·5	61·9	1	0	do do	Unearthed.
do 7	14·9	85·4	......	15	do do	Earthed.
do 7.....	11·9	82·3	1	10	do do	Unearthed
do 7......	12·1	81·0	1	5	do do	Earthed.
do 7......	11·7	81·2	1	1	do do	Unearthed.
do 7......	12·5	83·2	1	7	do do	Earthed.
do 7.....	13·5	82·6	1	13	do do	Unearthed.
do 7......	15·3	86·5	......	12	do do	Earthed.
do 7......	12·5	80·8	1	2	do do	Unearthed.
do 7	14·2	83·7	1	6	do do	Earthed.
do 7... ..	10·3	76·6	1	12	do do	Unearthed.
do 7......	13·2	82·0	1	1	do do	Earthed.
do 7......	11·8	86·0	1	5	do do	Unearthed.
....	13·2	81·8	1	0		
....	11·0	79·2	1	8		

The second table of data gives the analyses and particulars regarding the growth, etc., of beets sent in for examination. Those grown on the experimental farm at Nappan, N.S. (Nos. 46 and 47) proved to be good roots as to sugar content, coefficient of purity and weight. As they received no special culture, it would appear that both the soil and season were conducive to the production of a rich beet.

ANALYSES OF

No.	Grower.	Locality.	Variety.	Date of Sowing.
46	Experimental Farm.....	Nappan, N.S..	Dipper's Klein-Wanzleben ..	June 26..
47	do	do	Bulteau Desprez	do 26..
48	do	Agassiz, B.C.....................	do	....
49	do	do	Dippe's Klein-Wanzleben....	....
50	do	Indian Head, N.W.T..	Bulteau Desprez	May 9..
51	do	do	Klein-Wanzleben...........	do 9..
52	John Galbraith.....	Camden East, Ont.........	White Silesian........	April 28..
53	William Link...........	Harwich Township.............	....	....
54	do	do	....	....
55	William Weaver........	Chatham Tp., Lot 5, Con. 4......	From Schreiber & Sohn, Nordhausen, Germany.	June 10..
56	J. J. Payne	Raleigh Tp., Lot 22, Con. 3.... .	do do ..	....
57	John Langmoore........	do Lot 14, Con. 7......	do do ..	....
58	Andrew Neill.....	Harwich Tp., Lot 25, Con. 1.....	do do ..	....
59	Frank Suitar	Raleigh Tp., Lot 13, Con. 7......	do do ..	do 12..
60	Wm. Irwin.............	do Lot 13, Con. 6......	do do ..	....
61	M. S. Jackson..........	Chatham Tp., Lot 1, Con. 2......	do do ..	July 8..
62	Thos. Montgomery......	Raleigh Tp., Lot 17, Con. 6......	Skaife's Seed........	June 20..
63	F. Arnold	Camden Township	Schreiber's Seed	do 20..
64	J. Gall......	Masonville, Ont.....	Ferry's Seed................	....

Those grown at Agassiz, B.C., were not quite equal to the above, and those from the experimental farm at Indian Head, N.W.T., gave still lower results. Sufficient analyses have not yet been made, nor has the culture of the beets in these provinces been sufficiently thorough to allow of any conclusions being drawn at present as to the suitability of these districts for the production of a rich sugar beet.

SUGAR BEETS, 1891.

Date of Pulling.	Percentage of Sugar in Juice.	Co-efficient of Purity.	Average Weight of One Root. Lbs. oz.	Nature of Soil.	Remarks on Culture.
Oct. 22..	15·4	84·3	1 0	Light clay loam; well drained.	Rows 26 in. apart; plants thinned to 6 in. Not earthed up, but well cultivated.
do 22..	14·0	82·4	1 2	do do ..	
....	13·1	80·0	2 0	....	
....	13·3	82·6	1 14	....	
Sept. 28..	11·2	75·0	1 3	Fallowed previous autumn.	Rows 30 in. apart; plants thinned to 10-12 in. Well cultivated, but not earthed up.
do 28..	11·7	75·5	1 4	do do ..	
Oct. 26..	14·5	79·4	2 1	Sandly loam...............	Kept clean, rows 24 in. apart; plants thinned to 6-12 in.; partly hilled.
....	6·0	71·3	17 1	Clay do	Particulars not given.
....	10·6	75·2	2 14	do do	do
Oct. 24..	8·8	68·9	4 3	Rich clay loam..............	Not earthed; kept clean.
....	12·4	80·0	1 14	Sandy loam.................	Rows 14 in. apart; thinned to 6-10 in.; not earthed.
....	13·2	80·5	2 2	Rich loam..............	Rows 20 in. apart; thinned to 10 in.
....	11·0	75·5	3 6	do clay...................	Rows 24 in. apart; thinned to 8 in.
Oct. 28..	7·6	65·1	7 2	do black loam.........	Not well earthed; little cultivation.
....	8·3	66·5	3 1	do sandy do	Rows 22 in. apart; thinned to 8-10 in.; not covered.
....	12·3	74·4	1 14	Sandy loam...............	Rows 30 in. apart; thinned to 6-8 in.
....	12·4	79·4	3 7	do	Not covered; rows 20 in., plants 6-8 in. apart.
....	12·3	77·0	2 6	do	Not well covered; rows 18 in., plants, 10 in. apart.
....	13·2	83·3	1 6	....	Manured in winter with barn-yard manure.

In No. 53 we have an excellent example illustrating the statement that large roots are usually very poor in sugar. No. 54 is the same variety of beet, grown on the same soil and in the same way, and though still too large, contains 4·6 per cent more sugar.

The roots throughout were too heavy to give high sugar percentages, and neglect to keep them earthed had assisted in most instances in causing low coefficients of purity.

SORGHUM.

Seed of three varieties of sorghum was furnished by Mr. Corbeil, of Hull, P.Q., with the request that they should be sown and the percentage of sugar in the product estimated.

This plant, known as the Chinese Sugar Cane (*Sorghum vulgare*) has been extensively introduced into the United States. Its cultivation there, both as a fodder crop and for the production of molasses and sugar, has been a matter of much experiment for some years past by the experimental stations, and the manufacture of sugar from the cane has received Government and State aid, with the view of establishing, if possible, an economical process for its extraction.

It therefore became a matter of interest to ascertain what amount of sugar the plant would develop when grown here, and, in accordance with the wishes of Mr. Corbeil, the work already alluded to has been carried out at the Central Farm, Ottawa. The following analyses give the results:—

Sorghum.

	Percentage of Sugar in Juice.
No. 1	5·15
No. 2	6·29
No. 3	9·50

The minimum percentage of sugar in the cane, as grown in the United States, is about 2 per cent, and the maximum 18 per cent, according to the variety of the sorghum, the season, &c.

Our present figures show a cane altogether too poor for profitable extraction. Sorghum requires a long and somewhat dry season, and although the exact and most favourable conditions for a rich cane are, perhaps, as yet unknown, it seems probably certain that the frosts of autumn, common to the climate of Ottawa and vicinity, would be detrimental to the quality of the sorghum for manufacturing purposes

MILK: THE BABCOCK TEST.

The value of milk depends principally upon the percentage of fat it contains, and this is true whether it be purchased by the city consumer, the creamery or the cheese factory. Fat is the most important and most valuable of all the constituents of milk, though of course the solids-other-than-fat have a food value.

A great variability exists in samples of genuine milk as to the amount of fat they possess. This is owing to breed, food, environment, period of lactation and individual characteristics. Again, the composition of the milk of the same cow is by no means constant—the total solid matter, including fat, being subject to large fluctuation within comparatively short periods of time.

Within certain limits, water may be added or cream extracted from pure milk, without liability of detection.

For these reasons, it becomes apparent that the adoption of any ready and cheap method for accurately determining the amount of fat would result in the valuation of milk according to its *quality*, and the selling and buying of milk would be placed upon a more equitable basis than it now enjoys. Quality as well as quantity should be taken into account, for in this way the producer would be paid for his labour and skill and the purchaser receive his money's worth.

The method devised by Dr. Babcock, of Wisconsin, was examined in our laboratories during the past year, and the results compared with those obtained from the same samples by an accurate method of chemical analysis. The work was published, somewhat in detail, in Bulletin 12, of the Dairy series; I therefore here only insert conclusions.

Of the thirty-two samples tested in duplicate by the Babcock method, only two gave a difference between their duplicates, amounting to three-tenths (·3) of one per cent.; two varied in their duplicates two-tenths (·2) of one per cent.; fourteen differed to the extent of one-tenth (·1) of one per cent., and thirteen gave results identically the same.

The greatest difference between fat determinations by the Babcock test and gravimetric analysis on the same milk was (·25) a quarter of one per cent. This occurs in three instances only. Where the results are not identical, the variation is usually between one-tenth and two-tenths of one per cent.

From these data, therefore, we may safely conclude that when the Babcock test is made according to instructions given with the machine, *strictly reliable results are obtained*, and that the percentage of fat so found, allowing for the greatest error possible under such circumstances, will be well within one-quarter of one per cent. (·25) of the amount of fat actually contained in the milk.

CONDENSED MILKS.

The brands analysed were "Reindeer Brand," manufactured by the Condensed Milk and Canning Company, Truro, N. S., the "Shamrock Brand," of the Condensed Milk Company of Ireland, Limerick, and the "Fruit Brand," Gleeve Bros., London and Liverpool.

On opening the tins a preliminary examination of the physical characters of the milk afforded me the following data:

"Reindeer Brand" is of a slightly yellowish tint; in an excellent state of preservation; evidently a well-made milk and perfectly homogeneous throughout; readily soluble in water, yielding a milky fluid, very sweet, with a slightly "boiled" taste.

"Shamrock Brand," of a bluish-white tint. In a good state of preservation; easily soluble in water—the resulting fluid having a marked flavour of boiled milk. One tin of this brand was found on opening to be somewhat fermented, evidently owing to imperfect soldering.

"The Fruit Brand," somewhat darker in colour than the milk of the "Reindeer Brand." Well made and in a good state of preservation; easily soluble in water, with a sweetish "boiled" flavour.

The composition of the milks, as elicited by a careful and thorough analysis, is depicted in the subjoined table:

COMPOSITION OF CONDENSED MILKS.

——	Reindeer Brand.	Shamrock Brand.	The Fruit Brand.
Water	25·67	30·22	27·70
Total solids	74·33	69·78	72·30
Fat	7·29	·35	5·13
Curd (casein and albumen)	8·44	10·44	9·31
Milk sugar	13·49	10·80	14·30
Cane sugar	43·16	46·06	41·50
Ash (mineral matter)	1·95	2·13	2·06

The foregoing data were obtained from duplicate estimations of each constituent. It is possible that a part of the cane sugar appears as milk sugar ; in the process of manufacture some of the cane sugar may be converted into a form that by analysis would be determined with the milk sugar.

The following table may be useful in showing that when condensed milk is diluted until it contains a percentage of solids about equal to the percentage of solids in whole, pure milk, it is not a complete or well-balanced food. This is owing to the large proportion of cane sugar in the total solids, the sugar being added for the purpose of preservation.

If to one measure of these milks five measures of water be added, the composition of the resulting fluids will be as given below. The analysis of an average sample of pure milk is here added for the sake of comparison.

——	Reindeer Brand.	Shamrock Brand.	The Fruit Brand.	Pure, average Milk.
Water	87·50	88·34	87·95	87·25
Total solids	12·50	11·66	12 05	12·75
Fat	1·21	·06	·85	3·50
Curd	1·41	1·74	1·55	3·90
Milk sugar	2·25	1·80	2·38	4·60
Cane sugar	7·20	7·68	6·92	
Ash	·33	·38	·35	·75

It will be seen that these are all "sweetened" condensed milks, cane sugar being largely added as a preservative during evaporation. It has been held until quite lately, that the addition of cane sugar is necessary for keeping the milk in good condition. By an improved process, however, unsweetened condensed milk is now manufactured in Switzerland. This is said to be of excellent quality. I do not think it is to be found in the Canadian markets.

In the manufacture of condensed milk, when whole milk is concentrated, unless the greatest care be exercised, oily globules separate, and the flavour becomes more or less rancid. It is, however, apparent, from the condition and analysis of the "Reindeer" and "Fruit" brands, that excessive skimming, such as has been practised in the case of the "Shamrock" milk, is not required in order to preserve a good flavour. The unsweetened condensed milk before alluded to is whole milk, concentrated to one-third of its bulk. It is, however, not free from the "boiled" flavour, apparently an inevitable result of concentration.

Although condensed milk is an extremely valuable preparation, it cannot be considered as a perfect substitute for new milk, on account of its poorness in fat, its peculiar flavour and diminished palatability and its excess of cane sugar.

Great care and skill are requisite in the concentration of milk, and it should be the object of the manufacturer to avoid, as far as possible, the development of the boiled flavour, retaining, at the same time, the butter-fat of whole milk and avoiding the excessive use of cane sugar.

Flavour is perhaps of as much importance as any other factor in determining the value of a condensed milk, and in this respect the "Reindeer" brand, made at Truro, N. S., takes the first place among those examined. Its condition betokens care in its manufacture, and the tins have been soldered air-tight. In composition it is somewhat richer than the "Fruit" brand.

The "Shamrock" condensed milk is the poorest of the three, both in composition and flavour. It is practically fat-free, and has a marked taste.

The "Fruit" brand is a good milk, and in most respects may be considered equal to the "Reindeer" milk. Its condition, flavour and composition testify to its excellence as a sweetened condensed milk.

PART IV.

WELL WATERS.

7F—12½

In former reports I have dwelt at some length on the necessity of good water for man and beast if health is to be maintained, endeavouring to impress upon farmers and dairymen that without pure, fresh water cows cannot produce wholesome milk, and that a great deal of the sickness on the farm might be traced to impure, polluted water. It is only too true that in many instances the wells are so situated that they act as cesspools for the drainage from the stable or privy. A glance at the last column of the subjoined table will corroborate this statement. It is, therefore, gratifying to notice that increased interest is being evinced by our agriculturists with regard to the purity of their water supply.

During the past year twenty-nine samples of drinking water have been examined and reported upon. The analytical data will be found in tabular form, together with a brief report upon the quality of the waters as deduced from these figures. Particulars, in outline, regarding the source of supply and the proximity of contamination, follow:

ANALYSES of Well Waters, 1891.

Results stated in Parts per Million.

No.	Name.	Locality.	Date.	Free Ammonia.	Albuminoid Ammonia.	Nitrogen in Nitrates and Nitrites.	Chlorine.	Total Solids at 100° C.	Solids after Ignition.	Loss on Ignition.	Oxygen Absorbed at 80° F. In 15 Mins.	Oxygen Absorbed at 80° F. In 4 Hours	Phosphates.	Report.
1	Singleton, A. C.	Brighton, Ont	Dec. 22	·075	·110	......	1·00	235·0	185·0	50·0	·370	·805	....	A fair drinking water, though not first-class.
2	Lehmann, A.	Orillia, Ont.	Jan. 6	·015	·065	......	45·00	524·0	324·0	200·0	·336	·724	....	A very good water.
3	Wright, Chas.	Holland, Man	do 27	·040	·315	......	5·00	642·0	406·0	236·0	2·160	7·040	Traces	Too much vegetable organic matter; probably no sewage contamination.
4	Stoddart, W. E.	Bradford, Ont	Feb. 19	traces	·180	9·405	750·00	2878·0	2064·0	814·0	·576	1·456	Heavy traces	Polluted by sewage; a very dangerous water to use.
5	Wenman, Wm.	Souris, Man	June 1	·09	·140	......	6·5	2148·0	1856·0	292·0	1·04	2·36	Very heavy traces.	Highly suspicious.
6	do	do	do 1	·875	·140	......	9·0	2960·0	2486·0	474·0	1·48	2·96	do	A very bad water; totally condemned.
7	Pollock, W. C.	Almonte, Ont.	do 12	·020	·050	......	46·0	542·0	226·0	316·0	·1512	·4320	....	A very good water.
8	Foster, W. A.	Hintonburgh, O.	July 2	·015	·130	12·254	66·0	704·0	402·0	302·0	·752	1·352	Very heavy traces.	Evidently contaminated; use attended with danger.
9	Hill, Robt.	do	do 2	·010	·075	4·530	56·0	642·0	464·0	178·0	·328	·632	Traces	Perhaps a reasonably safe water, though not first-class.
10	do	do	do 2	·005	·073	5·75	64·0	656·0	502·0	154·0	·532	·976	Very heavy traces.	Suspicious; use attended with danger.

ANALYSES of Well Waters, 1891—*Concluded.*

Results stated in Parts per Million.

No.	Name.	Locality.	Date.	Free Ammonia.	Albuminoid Ammonia.	Nitrogen in Nitrates and Nitrites.	Chlorine.	Total Solids at 100° C.	Solids after Ignition.	Loss on Ignition.	Oxygen Absorbed at 80° F. In 15 Mins.	Oxygen Absorbed at 80° F. In 4 Hours	Phosphates.	Report.
11	Gillespie, Thos....	Hintonburgh, O.	July 2..	·035	·175	9·68	26·0	474·0	370·0	104·0	·872	1·744	Traces..........	Not safe for drinking purposes.
12	Feely, Wm.......	Hull, Que	do 20..	·06	·08	1·08	12·50	342·0	280·0	62·0	·568	1·104	Heavy traces ...	A second-class water.
13	Learned, H. B....	Learned Plain, Q	do 25..	·14	·09	......	5·50	....	......	......	......	......	....	Dangerously contaminated.
14	Mitchell, R.......	Yorkton, N.W.T	do 29..	·12	·17	......	7·00	570·0	440·0	130·0	......	......	....	A bad water.
15	Ross, A. S........	Hansford, N.S..	Aug. 4..	·15	·07	3·830	20·50	228·0	128·0	100·0	·3276	·7020	Traces..........	Polluted by sewage matter.
16	Jamieson, John...	Kars, Ont	do 19..	·13	·118	......	3·50	230·0	184·0	46·0	1·096	2·180	Traces..........	Contaminated; not safe for drinking purposes.
17	Dean, Jas	Calgary, N.W.T.	Sept. 29..	·04	·10	......	6·00	....	......	......	......	......	....	Insufficient quantity for complete analysis.
18	Harris, Wm	do ..	do 29..	·06	·08	......	11·0	....	......	......	......	......	....	Not first-class waters, but probably not dangerously contaminated.
19	Town Hall........	do ..	do 29..	·06	·068	......	6·0	....	......	......	......	......	....	
20	Grand Central Htl	do ..	do 29..	·08	·064	......	5·0	....	......	......	......	......	....	Highly suspicious.
21	Scott, W. L	City View, Ont.	Oct. 13..	9·28	6·28	......	100·0	2345·0	1208·0	1137·0	......	......	Heavy ppte.....	An exceedingly bad water.
22	do	do ..	do 13..	160·60	......	....	......	11930·0	5770·0	6160·0	......	......	Very heavy ppte.	Really liquid manure.
23	Grand Central Htl	Calgary, N.W.T.	do 28..	·08	·05	·428	1·50	164·0	142·0	22·0	·04	·40	Traces..........	Indicates previous contamination.
24	Moore, D.........	do ..	do 28..	·02	·024	1·120	1·50	212·0	178·0	34·0	·276	·678	do	do do ..
25	Water works......	do ..	do 28..	·028	·06	·174	·50	170·0	148·0	22·0	·080	·372	None...........	An excellent water.
26	Robson, Hodder ..	do ..	do 28..	·00	·02	4·80	4·50	236·0	158 0	78·0	·216	·448	Traces..........	Indicates previous contamination.
27	Galbraith, John...	Camden East, O.	Nov. 10..	·057	·136	·573	13·0	417·2	354·0	63·2	·1856	·5036	do	Highly suspicious; use attended with danger.
28	Brodie, R.........	St. Henri, Que..	do 24..	·170	·190	13·625	105·0	1130·0	1014.0	116·0	·448	·844	Very heavy traces.	Very bad; condemned for drinking purposes.
29	Fortier, Victor....	Ste. Adèle, Que.	do 26..	·024	·27	·786	2·0	152·0	72.0	80	1·064	3·504	Heavy traces...	Too much vegetable matter, otherwise a good water. Would be improved by filtering.

No. 1. Spring in pasture; formation of calcareous tufa around mouth of spring considerable amount of vegetable, suspended matter, which should be filtered out.

No. 2. Well, 18 feet deep, dug in heavy clay with quicksand bottom; 100 feet from Lake Couchiching. The well is lined with stones laid in cement, to keep out surface water, resting on an oak crib.

No. 3. Well, 17 feet; surface soil 1½ feet black mould, over clay and gravelly sand; about 4½ feet water; cribbed with pine boards; evidently largely soakage water; considerable quantity of vegetable *débris;* solids blackened on heating, giving off disagreeable odour, indicating presence of organic matter. This water should be passed through an efficient filter before using.

No. 4. Depth of well, 40 feet; distance from privy, 80 feet; from barn, 300 feet; soil, heavy clay loam; water in well, 15 to 20 feet; water has distinct "salty" taste. Well dug 23 years ago and not lately cleaned out.

No. 5. Well, 35 feet deep; surface soil, 20 inches vegetable mould; subsoil, sandy loam (9 feet), resting on heavy clay; 72 feet from privy; water has offensive taste and smell.

No. 6. Well, 53 feet deep; cribbed with spruce; soil similar to that of No. 5, except that bottom is quicksand; 70 yards from stable; well evidently acts as cesspool.

No. 7. Well, 55 feet deep; clay 12 feet; bored in rock 43 feet; 50 feet from stable; property well drained.

No. 8. Depth of well, 14 feet; clay loam, 4 feet; bored in rock 10 feet; 35 feet from privy and stable; not cleaned for three years.

No. 9. Bored well, in rock, 45 feet; privy 100 feet from well. Well not used for some years, but lately cleaned.

No. 10. Depth of well, 13 feet; clay loam, 5 feet; gravel, 1 foot; hard pan, 1 foot; rock (blasted), 6 feet; 70 feet from stable, 50 feet from privy, about 18 in. of water.

No. 11. Depth of well, 18 feet; light loam, 2 feet; rock, 16 feet; 60 feet from privy.

No. 12. Well, 16 feet deep to rock; soil, loam, 3 feet; gravel, 13 feet; 40 feet from stable and privy; height of water, 10 feet.

No. 13. Well in low ground, 12 feet deep; black muck, 2 feet; hard pan, 8 feet; limestone, 2 feet; depth of water, usually 8 feet; barn, 60 feet away; privy about 180 feet, on higher ground.

No. 14. Said to be a spring; water contained a quantity of flocculent matter; sample collected one month before analysis.

No. 15. Well, 20 feet deep; water therein from 5 inches to 15 inches; distance from barn, stable and privy, 170 feet; from sink, 22 feet; soil very hard and full of fissures, through which water percolates.

No. 16. Depth of well, 12 feet; sandy loam, 2 feet; clay and sand, 10 feet; height of water, 4 to 5 feet; situated at edge of bush in pasture.

No. 17. Well, 14 feet deep, recently dug; gravelly soil; water rises and falls with that of the Bow River.

No. 18. Well, 25 feet deep, dug two years ago; privy within 50 feet; gravelly soil.

No. 19. Well, 20 feet deep; privy distant 75 feet; not cleaned since dug two years ago; gravelly soil.

No. 20. Well, 30 feet deep, within 20 feet of a cesspool and 40 feet of a privy; quite close to stable; gravelly soil.

No. 21. Depth of well, 56 feet, bored; usually about 25 feet water; 7 yards from house, 70 yards from stable, 100 yards from silo; rock in which well is bored is full of cracks and fissures, through which evidently the soakage from silo or barn, or both, find its way into the well.

No. 22. Well about 7 feet deep, in clay, 50 yards from stable, 150 yards from silo; water filthy, very bad, and sickening.

Nos. 23, 24 and 26 are from wells of from 14 to 25 feet in depth, dug in a light, gravelly soil, and all more or less contiguous to contaminating sources, as stables and privies. Their analyses, standing by themselves, would not absolutely condemn them for use, though they would not be considered "first class." These wells, however, are evidently fed from the Bow River by infiltration, and a comparison of the analytical data of the latter water (No. 25) clearly shows that these waters receive pollution to some extent.

No. 25. Drawn from the Bow River, near Calgary; clear; no *debris;* a good water.

No. 27. Depth of well, 12 feet 6 inches, in gravelly clay with limestone bottom. Distance from house, 30 feet; from hog yard, 130 feet; from barn, 300 feet. Most probably receives soakage from hog yard through crevices of the rock.

No. 28. Well, 42 feet deep, in sandy and gravelly soil. Distance from barn, 120 feet; average depth of water, 8 feet; 60 feet from closet. A clear, bright water, with no deposit, but very badly polluted, making it unfit for use.

No. 29. Creek water; no sewage contamination; contains suspended vegetable matter, which should be removed by filtration.

General Remarks on Waters and Water Supplies.

The chief impurities found in drinking waters, as detected by chemical analysis, are of an organic nature, and arise from the presence of decomposing animal or vegetable matter, or both. The former is to be regarded as the more deleterious of the two, and comprises the solid and fluid excreta of animals, and decaying animal matter; vegetable pollution consists of peaty matter—the more or less decomposed remains of plants. Although vegetable matter is not as injurious as that of animal origin, an excessive quantity is very apt to cause diarrhœa and kindred complaints.

Whether the organic matter itself always acts in the water as a poison or not is yet a question open for discussion, though there seems to be ample evidence that in many instances active organic poisons are developed by the decomposing matter.

It has, however, been well established that it is the organic matter of a water that forms the food for the growth of bacteria—microscopic plants, among which are the disease germs—and cases of typhoid (a germ disease) have been repeatedly traced to drinking water surcharged with organic matter.

For these reasons we may safely conclude that a water containing much organic matter must be more dangerous to health than water comparatively organically pure.

It is of the first importance, therefore, to discover the degree to which any water may be contaminated by organic matter and to endeavour to establish whether such be vegetable or animal.

The amounts of free and albuminoid ammonia, of the oxygen absorbed in fifteen minutes and four hours, and of chlorine, are a measure of the organic impurities of a water.

Large quantities of free ammonia associated with a considerable amount of chlorine prove contamination with sewage.

Small quantities of free ammonia and chlorine and high amounts of albuminoid ammonia and "oxygen absorbed" indicate vegetable pollution.

The presence in considerable quantities of nitrogen in nitrates and nitrites—especially in shallow wells—indicates previous sewage contamination.

When the ratio of oxygen absorbed in 15 minutes to that absorbed in 4 hours is as 1:2, dissolved vegetable matter is indicated; when this ratio approaches 1:1·5, the presence of animal organic matter is shown. A water contaminated with vegetable matter will absorb or use up more oxygen than one polluted with animal matter.

The bright and clear appearance of a water is no guarantee of its wholesomeness. Many badly polluted waters are sparkling and cold.

As every water must be judged according to its source and surroundings, it is impossible to lay down rules that could be applied rigidly in every case, though it

has been abundantly shown that a good water, wholesome for use, should not contain more than ·08 parts per million of free ammonia, nor more than ·10 parts per million of albuminoid ammonia, and the amounts of chlorine and total solids should not exceed 70 and 570 parts respectively.

Those who are about to dig wells are cautioned against locating them in barn-yards and stables or near any source of pollution—and this is especially urged where the soil is sandy or gravelly. It has been proved beyond dispute that the soakage from such contaminating sources will travel comparatively long distances in light soil, and it is in such that the well will act as a cesspool.

The surroundings of the well should at all times be kept clean, and the well itself examined from time to time as to its freedom from refuse material. Vegetable *debris* and dead animals are often the cause of impure water. The latter has frequently been found on an examination of the well, subsequent to a report that the water is polluted.

As far as time permits analyses of water are made for farmers free of expense, provided that the express charges are prepaid. As the right collection of the water is a matter of great importance, those desiring an analysis are requested to write for the necessary instructions before taking the sample.

EXPERIMENTS ON THE PREVENTION OF HARD SMUT OR BUNT BY TREATMENT WITH SOLUTIONS OF COPPER SULPHATE (BLUE VITRIOL), IRON SULPHATE (GREEN VITRIOL) AND "AGRICULTURAL BLUE STONE."

In the report of this department for last year, I gave the results of a series of experiments conducted to ascertain the effect of the above solutions on the vitality of the wheat germ. The conclusions drawn from this work were briefly as follows:—

1. That the vitality of the wheat seed after being soaked for 36 hours in a solution of blue vitriol (copper sulphate), of the strength of 1 lb. to 8 gallons of water, was seriously impaired.

2. That when wheat was treated in a similar manner with a solution of green vitriol (iron sulphate)—strength 1 lb. to 8 gallons—the germ was but little affected, though the growth of the plants was at first retarded.

3. That when the seed was merely sprinkled with the solution of copper sulphate the loss of vitality was very much lessened.

4. That if wheat be soaked for 36 hours in a solution of "agricultural blue stone" (1 lb. to 8 gallons), a deleterious effect is to be noticed—evidently owing to this salt containing 30 per cent. of copper sulphate. But if the seed be sprinkled only with this solution the per cent of loss of vitality is much less.

Experiments had also been tried to find out what effect these solutions severally had in preventing the development of hard smut or bunt. These latter failed, owing to the fact that the hard smut did not appear on any of the trial plots here. Though extremely damaging to the wheat crop in Manitoba and the North-West Territories, hard smut seldom develops in this locality. For this reason it was proposed to grow the wheat, after treatment with the different solutions, on the experimental farms at Brandon and Indian Head, and note the results.

The Work of 1891.

A further supply of "agricultural bluestone" was procured, and on analysis yielded the following figures:—

Sulphate of iron (green vitriol)	69·39
do copper (blue vitriol)	30·61
	100·00

These show it to be identical in composition with that used last year.

EFFECT on the Vitality of Wheat by Smut Preventives, 1891.

Variety of Wheat, 200 grains.	Treatment.	Sown 1891.	23rd March.	25th March.	28th March.	30th March.	1st April.	4th April.	6th April.	Total.	Percentage of Vitality.	Percentage of Strong Plants.	Percentage of Weak Plants.
White Connell	Untreated	March 17	160	174	178	179	......	......	......	179	89·5	84	16
do	Copper sulphate	do	67	130	158	165	......	......	......	165	82·5	70	30
do	"Agricultural bluestone"	do	82	158	180	183	......	......	......	183	91·5	83	17
do	Iron sulphate	do	101	172	178	180	......	......	......	180	90·0	87	13
Red Fife	Untreated	do	180	188	190	......	......	......	......	190	95·0	97	3
do	Copper sulphate	do	70	111	143	150	157	164	......	164	82·0	84	16
do	"Agricultural bluestone"	do	104	174	193	196	......	......	......	196	98·0	92	8
do	Iron sulphate	do	153	188	192	......	......	......	......	192	96·0	96	4
White Fife	Untreated	do	167	185	185	187	......	......	......	187	93·5	70	30
do	Copper sulphate	do	50	99	130	130	139	140	43	143	72·5	70	30
do	"Agricultural bluestone"	do	93	156	178	185	186	......	......	186	93·0	69	31
do	Iron sulphate	do	129	177	183	......	......	......	......	183	92·5	80	20
Judket	Untreated	do	164	177	179	......	......	......	......	179	89·5	92	8
do	Copper sulphate	do	19	53	110	127	129	132	......	132	66·0	76	24
do	"Agricultural bluestone"	do	83	156	168	170	......	......	......	170	85·0	95	5
do	Iron sulphate	do	128	152	155	156	......	......	......	156	78·0	95	5
Ladoga	Untreated	do	112	137	......	......	......	......	......	137	68·5	82	18
do	Copper sulphate	do	37	79	114	116	......	......	......	116	58·0	84	16
do	"Agricultural bluestone"	do	112	112	141	144	......	......	......	144	77·0	89	11
do	Iron sulphate	do	138	149	151	......	......	......	......	151	75·5	94	6

The solutions experimented with were copper sulphate, "agricultural bluestone" and iron sulphate, each of the strength of 1 pound to 8 gallons of water.

The wheats used were White Connell, Red Fife, White Fife, Judket and Ladoga.

The treatment was merely sprinkling the grain with the solution under trial, and allowing it to dry spontaneously.

The vitality of the wheat so treated was determined in the seed-testing house, and samples of each forwarded to the experimental farms at Brandon, Manitoba, and Indian Head, North-West Territories. Mr. Bedford, superintendent at Brandon, reports that unfortunately owing to high winds that prevailed in the spring the seed was blown out of the ground, though considerable care had been taken to select a suitable plot for the experiment. Mr. Mackay, superintendent at Indian Head, met with better fortune, and his results, obtained with great carefulness, are now reported upon.

The percentage of vitality and of strong and weak plants will be found here, as also the number of growing plants upon the dates which head the columns.

On the whole, these results corroborate those obtained last year, though the differences in the percentages of vitality, in some instances, are not so marked. This is probably due to the fact that the treatment this year was not so severe as in some of the experiments of last season, in which the seed was allowed to dry 13 days before sowing. In these experiments the seed was planted immediately on becoming dry. It would seem, both from the work of 1890 and 1891, that the deterioration of vitality was to a certain degree measured by the length of time the seed was allowed to dry after sprinkling with the copper solutions.

The table makes clear that the ultimate effect upon the seed by solutions of agricultural bluestone and iron sulphate, when used as explained and of the strength given, is so small that it may be disregarded ; or, in other words, that owing to the injury to the vitality being so slight, no objection could be raised to such treatment, granting that it were efficacious in preventing smut.

The loss of vitality due to copper sulphate solution, averaging the above experiments, is equal to 15 per cent.

The retarding effect on the germination and growth of the young plant by treatment with these solutions is again well brought out. This is most marked in the case of copper sulphate and least in that of iron sulphate. That of the agricultural bluestone is between the two, a position evidently the result of the copper contained in this article. As remarked in my last report on this subject, the plants from treated seeds become vigorous and robust after the roots had assumed their functional activity.

Effect on the Prevention of Smut.

Three ounces of each sample of grain, treated and untreated, were sent, in March last, to Mr. Angus Mackay, Superintendent, experimental farm, Indian Head, N.W.T., with a request that they be sown on 100 square feet of soil (at the rate of 1¼ to 1½ bushels to the acre), and the good and smutty heads thereon counted before harvesting. Mr. Mackay has very carefully conducted this work, and I now give his results:

RESULTS obtained at the Experimental Farm, Indian Head, 1891, showing the value of certain Smut Preventives.

Variety of Wheat.	Treatment.	No. of Smutty Heads.	No. of Good Heads.
White Connell	Untreated	6	3,479
do	Copper sulphate	7	3,422
do	"Agricultural bluestone"	3	3,942
do	Iron sulphate	6	3,575
Red Fife	Untreated	164	3,189
do	Copper sulphate	1	4,420
do	"Agricultural bluestone"	7	3,983
do	Iron sulphate	168	3,722
White Fife	Untreated	10	3,690
do	Copper sulphate	0	3,840
do	"Agricultural bluestone"	0	3,810
do	Iron sulphate	2	3,595
Judket	Untreated	49	3,905
do	Copper sulphate	1	3,760
do	"Agricultural bluestone"	0	3,850
do	Iron sulphate	38	3,960

To discuss briefly these results :

In the case of the "White Connell," the number of smutty heads is very small, and no great difference is to be noted between the treated and untreated grain in this particular. This experiment gives no data from which any inference may be drawn as to the relative efficacy of the solutions.

The Red Fife, however, shows a fairly large number of smutty heads in the untreated sample and affords an excellent example for the study of this question. The number of smutty heads is practically the same in the untreated and iron sulphate experiments. By the action of copper sulphate, this number was reduced from 164 to 1 and by agricultural bluestone from 164 to 7. The value of copper sulphate (blue vitriol) and agricultural blue stone and the inefficiency of iron sulphate for destroying smut seems to be nere well emphasized.

With White Fife, although the numbers throughout are small, like results are obtained, and the inferences with regard to the relative smut-destroying powers of the solutions are the same as with the Red Fife.

The experiments with Judket give similar results, with slight reduction in the number of smutty heads when treated with iron sulphate. Practically there is no appearance of smut after copper sulphate and agricultural bluestone.

Therefore these experiments, while serving to prove the efficacy and almost equal worth of copper sulphate and agricultural bluestone, go to show that for destroying smut spores, iron sulphate is almost valueless.

These experiments will be continued during the season of 1892.

A strong solution of bluestone if in contact with wheat for a long time will undoubtedly affect the vitality of the latter, but as the experiments just cited show, a treatment such as I have described results only in benefit. The small amount of loss due to this treatment in some instances is not to be compared with the advantage accruing from having wheat free from smut, which follows the use of bluestone.

EFFECT OF COPPER SOLUTIONS UPON THE FERTILITY OF THE SOIL.

An article lately appeared in a leading horticultural paper on what was held to be the deleterious action to the fertility of the soil from the copper in the solu-

tions used as fungicides. It was there shown that, in the spraying of large orchards, a considerable quantity of copper sulphate was used annually, and it was maintained that this would accumulate in the soil—as it all eventually finds its way there—and finally there was very great danger that this would sterilize or render barren the soil.

At the request of several correspondents, who were anxious to know how far these statements were correct, I made a report thereon, the substance of which I now insert as affording some information to orchardists on this important subject.

Properly applied, *i.e.*, at the right time and in the correct proportions, the copper fungicides have proved and are proving themselves to be of inestimable benefit in the orchard and in the vineyard. The increased value of the fruit has more than repaid, by a large margin, the outlay for spraying apparatus and materials and cost of application, and I believe the time has come when no fruit-grower can afford to ignore this useful means of preventing fungus diseases. Not the least important element in successful fruit-growing, now-a-days, is keeping in check fungus growths and destructive insects, and, for this purpose, our present hope lies in the application of arsenical and copper solutions. By the more extended use of them the hope is confidently entertained that the loss occasioned by injurious insects and fungi will be greatly lessened year by year throughout the Dominion.

The danger to the fertility of the soil by the use of fungicides has, by some, been unduly magnified. In the first place, the large quantity of fungicides as recommended heretofore for each acre of trees per annum (400 gallons containing 108 lbs. of copper sulphate)* is considered by many of the best authorities as unnecessary. Three or four sprayings are equally efficacious with a larger number, provided the operation is begun early enough in the spring. Granting that each application requires, per acre, about 30 gallons, the total quantity of Bordeaux mixture per acre for the season would be between 90 and 120 gallons, containing from 24½ lbs. to 32½ lbs. of copper sulphate.

Secondly, Bordeaux mixture has to a very large extent been replaced by copper carbonate, either dissolved in ammonia—known then as ammoniacal copper carbonate—or applied simply in suspension. When applied in suspension or dissolved, the amount of copper carbonate per 25 gallons of water is two ounces—a quantity containing the same amount of copper as four ounces of copper sulphate. (Directions for preparing these solutions are to be found in Bulletin 10 of the Experimental Farm series.) Spraying with the fungicides, each acre of vines would receive during the season the equivalent of 1 lb. to 1¼ lbs. of copper sulphate. It is thus made manifest that by this treatment—one highly recommended by those who have had experience with it—no such quantity as 108 lbs. of copper sulphate is required per acre.

By far the greater amount of copper that reaches the ground is in a condition that is insoluble in water, or becomes so after a short time. In the case of Bordeaux mixture, I would point out that copper sulphate, as such, ceases to exist immediately after the addition of the lime, sulphate of lime (land plaster) and an insoluble compound of copper resulting. The argument, therefore, that the sulphuric acid of the copper sulphate immediately combines with the potash of the soil, which is subsequently lost, does not hold good. The sulphate of lime does, to a limited extent, set free potash in the soil, in a condition assimilable by plants, and on account of this beneficial function land plaster is often used as a fertilizer. The presence of minute quantities of an insoluble copper compound cannot, in my opinion, affect disastrously the fertility of a soil, nor act as a poison to plants. The acid fluids secreted by rootlets may have the power of rendering such soluble and thus capable of absorption, but unless the soil were heavily charged with copper compounds no evil effects from this cause need be anticipated. Plants can only absorb into their tissues fluids and gases, and although they have the power to a limited extent of rendering soluble certain substances, insoluble compounds, such as oxide and carbonate of copper, are for the most part harmless and inert.

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* Bordeaux mixture contains 6 lbs. copper sulphate and 4 lbs. of lime in 22 gallons of water. The lime neutralizes the caustic effect of the copper sulphate, rendering the mixture innoxious to foliage.

For many years the application of Paris green (arsenite of copper, insoluble) has been in use for the destruction of the Colorado potato beetle. If the copper of such became and remained easily soluble, thousands of acres would long ere this have been rendered barren.

To sum up, my contention is that the copper which reaches the ground from properly conducted spraying is so minute in quantity and so insoluble in nature that no fear need be entertained of injury to growing vegetation. It certainly seems to me that it would be very foolish to relinquish so patent a means of preserving our orchards and vineyards and their fruit, before science and practice proclaimed the true nature of such to be a curse rather than a blessing.

THE APPLICATION OF PARIS GREEN IN SOAP SOLUTION AS AN INSECTICIDE.

The question has arisen whether the toxic action of Paris green as an insecticide is to any extent weakened or destroyed when this poison is applied with soap solution. For the purpose of answering this problem, I have carried out a number of laboratory experiments, the results of which form the basis of the present report.

Paris green (aceto-arsenite of copper) is an emerald green salt which is practically insoluble in water. The first experiment consisted in shaking up Paris green with water constantly for more than a week. The Paris green was then filtered off. Not a trace of arsenic could be detected in the filtrate, though the most delicate chemical process was employed.

Strong ammonia readily and completely dissolves Paris green, forming a deep blue solution and capable of being diluted with water, without decomposition or precipitation.

The fixed alkalies—potash and soda—in strong aqueous solution decompose this poison, the blue hydrate of copper separating. This on heating first becomes changed into the black oxide, and finally the red cuprous oxide, the arsenic going into the solution as potassium arsenite.

A number of experiments were then tried as to the solvent action of different soap solutions on this insecticide. The soaps used were (1) whale oil soap, (2) common brown soap, (3) "English" soft soap.

The whale oil soap, strength 1 lb. to 8 gallons, was not alkaline to test paper. The Paris green was shaken up with this solution repeatedly for five days and the mixture then filtered. Not a trace of arsenic could be detected in the filtrate, showing that no decomposition of the Paris green had taken place. The latter retained its bright green appearance throughout the experiment.

The solutions of the "common brown soap" and the "English" soft soap were not of any stated strength, but were made as strong as it was possible to make them. By this means a severe and extreme test was made in each case.

The common brown soap was strongly alkaline. This solution after acting upon it for five days was found to slightly decompose the Paris green, arsenic being detected in the filtrate. The residual Paris green was, however, bright green, which together with the fact that but traces of arsenic passed into solution, shows that only to a very slight degree had the poison been acted upon.

With the "English" soft soap solution, which was much more strongly alkaline than the preceding, there was more decomposition, *i.e.* more arsenic passed into solution and more copper precipitated than in the experiment just cited. The treatment was similar as in the previous trials, and the result showed that heavy traces of arsenic had passed into solution, while at the same time a slight brown deposit of oxide of copper was to be noticed on the residual Paris green.

If it were necessary for the efficacy of the poison that the Paris green be applied in such liquids as would have no decomposing or solvent action upon it, the results of these experiments show that no practical harm or deterioration would result from using it with soap solution. When it is remembered, however, that Paris green, although insoluble in water, passes more or less rapidly into solution by the action of

the digestive fluids before its toxic effects can be conveyed throughout the insects' body by the circulatory system, there seems to be no good ground for condemning an application in which traces of arsenic are already soluble. The chief reason against the use of white arsenic is on account of its injurious effect on foliage —it being soluble in water and acid in its character. The arsenic set free in the soap solution is neutralized by the free alkali of the soap, so that where soap solution can be used *per se* without harm, no injurious results need be apprehended when to it is added the Paris green in the right proportion.

In all the above experiments the soap solution was at the ordinary temperature of the atmosphere when added to the Paris green. If heat had been used undoubtedly a larger portion of arsenic would have gone into solution.

THE RESULTS OF AN EXPERIMENT TO PROVE THAT APPLES ARE NOT POISONED BY SPRAYING WITH PARIS GREEN FOR CODLING MOTH.

A statement appeared a short time ago in a horticultural paper published in Great Britain to the effect that Canadian apples contained a small quantity of arsenic and were consequently poisonous. This, it was said, was due to our practice of spraying with Paris green after the petals have dropped, in order to preserve the fruit from the ravages of the codling moth. This assertion received wide circulation in the British press and was calculated to do a great deal of harm to the Canadian export apple trade. It is not the first time that a rumour to this effect has been set afloat, either by interested or ignorant people. That the suspicion is entirely without a foundation has been asserted by scientists and practical men in Canada and the United States on several occasions. Hitherto, however, no chemical work has been done in Canada to place before our horticulturists and shippers, as well as the British people, scientific proof for refuting the statement.

Mr. James Fletcher, Dominion Entomologist, therefore procured a sample of apples that undoubtedly had been sprayed, and I submitted them to a careful chemical analysis. The apples examined (Rhode Island Greenings) were kindly furnished by Mr. Woolverton, editor of the *Canadian Horticulturist*, who personally vouches for the fact that they were twice sprayed last June with Paris green of the strength of 1 lb. of the material to 200 gallons of water. The apples when received were just as they had come from the trees, *i.e.*, had not been rubbed, so that any arsenic left from the spraying would still be on the skin.

The quantity tested for arsenic was 9 lbs. 7 ozs., measuring about one peck. The process to which they were submitted is one that affords extremely accurate results, and is considered the most delicate of all for the detection of arsenic. It is capable of revealing the presence of one fifty-thousandth part of a grain of arsenic. If 23,000 bushels of apples contained $2\frac{1}{2}$ grains of arsenic (As_2O_3), the minimum fatal dose for an adult, the poison could have been detected by this method.

Though all care was exercised not a trace of arsenic could be detected, thus showing the complete absence of this poison in these apples that had been twice sprayed with Paris green.

I am of the opinion that further experiments of this nature would only serve to corroborate this negative result and to prove that there are no grounds on which to base a suspicion that our sprayed apples are poisonous.

The insoluble character of this poison, precluding its assimilation by the apple if such were possible, the infinitesimal part of Paris green that can remain on the apple, the frequent rains subsequent to the spraying, and the fact that apples are pared before using, all go to substantiate the argument that there is not the slightest danger of poisoning in using sprayed apples.

REPORT OF THE ENTOMOLOGIST AND BOTANIST.

(James Fletcher, F.R.S.C., F.L.S.)

Wm. Saunders, Esq.,
Director Dominion Experimental Farms,
Ottawa.

Sir,—I have the honour to hand you herewith a report upon some of the work carried on in my department during the past year. Owing to want of assistance and facilities for work, many things which might have been attended to have been held over for the present. I have treated at some length certain of the more important subjects which have been brought officially under my notice.

DIVISION OF ENTOMOLOGY.

There has not been, during the past season, any attack upon crops of special severity. Fruit pests have probably demanded more attention than any other class, owing to the exceptional abundance of such apple-tree pests as a new species of case-bearing caterpillars, the Eye-spotted Bud-moth, the Oblique-banded Leaf-roller, and in certain districts of the Autumn Canker-worm. A new attack of some interest by the last-named insect was upon the ash-leaved maples used as shade trees in the city of Winnipeg. This, however, could of course be easily prevented by a timely spraying with a weak mixture of Paris Green. The Vancouver Island Oak-looper, which has now for some years stripped the oak trees around the city of Victoria, was during the past autumn much reduced in numbers by the attacks of a fungous disease which has been kindly identified by Professor Roland Thaxter as *Sporotrichum globuliferum*, Spegazzini, a fungus which has done good service in reducing the Chinch bug in Illinois and other States. It also attacks many other insects, and has been used by Professor Forbes in his late experiments upon Chinch bugs, Cecropia moths, the Grain Aphis and other plant-lice and some saw-fly larvæ. (Ill. Rep. XVII, p. 82.) Bark of oak trees sent from Victoria early in 1891, by Mr. W. H. Danby, who has given me much assistance in working out the life history of this pest, contained thousands of good eggs of the moth from which these caterpillars were hatched. A similar packet of bark received this winter contained a great number of dead caterpillars and chrysalids, all attacked by the fungus, and so few eggs that I could not find one. Later in the winter, however, seven specimens of caterpillars were secured. There must, therefore, have been some cause for the great diminution in the number of eggs laid, which cause I judge to be this fungus. Field crops all over the Dominion have as usual suffered to a certain extent from the various kinds of Cut-worms. *Agrotis ochreogaster* (=*A. turris*), a large and voracious caterpillar, when full grown $1\frac{1}{2}$ inches in length and of the usual dull colours, but bearing on its back a broad reddish stripe, has been very injurious in many places, extending from Ottawa as far west as Calgary. In the Ottawa district *Noctua fennica*, the "Black Army-worm," was again this year very abundant and destructive, particularly to clover, pease and asparagus. Spreading from a clover field on the Experimental Farm they over-ran, about the third week in May, nearly three acres of a pea field, which they swept almost bare. This attack was stopped promptly by spraying a strip 50 feet wide, ahead of the caterpillars, with Paris green, 1 lb. in 100 gallons of water, by means of Knapsack sprayers.

The Grain Plant-louse (*Siphonophora avenæ*), occurred in small numbers as usual. Sensational accounts in the newspapers proved upon enquiry all to be gross exaggerations. The Tomato Stalk-borer (*Gortyna cataphracta*) was slightly more abundant

than usual, and a new attack upon tomatoes was observed by Mr. W. J. Baylay, of New Edinburgh, in which the plants were cut off by being girdled by the punctures of the Buffalo Tree-hopper (*Ceresa bubalus.*)

Some injuries reported to have been done to potatoes by the Colorado Potato-bug in the west proved to be due to two of the Blister-beetles (*Epicauta Pennsylvanica*, De G.), in Manitoba and *Epicauta maculata* (Say), in British Columbia. This latter is a very serious pest. Mr. C. F. Cornwall writes from Ashcroft, B.C. : "I send you specimens of what we call the grey beetle. It is a most destructive insect pest in this neighbourhood, generally putting in an appearance by the middle of May and lasting till the middle of August. It arrives in enormous numbers very suddenly. In cool weather it is sluggish, and can be brushed from the vegetation into an old coal-oil tin or other receptacle. It is only in this way that it can be prevented from regularly eating up such things as beet-root, spinach, windsor beans, potatoes, &c. I have seen many acres of field potatoes with the haulms actually stripped of every green leaf by this beetle."

Hops in Prince Edward county were attacked by a species of *Gortyna*, the eggs of which are laid on the young shoots, and the young caterpillars after a while drop to the ground and attack the plant at the collar, just beneath the surface of the soil. I am now at work on this pest with the valuable assistance of Mr. S. J. Cotter, of Northport. The Hop Aphis occurred in small numbers in Ontario and up the Fraser River in British Columbia.

A new pest of turnips and radishes in the North-West Territories and Manitoba I have reported on at length in another page of this report.

Some false reports with regard to the supposed danger of spraying with Paris Green I have thought it well to notice, and Mr. Shutt has kindly analysed with great care some apples procured for the purpose, which prove conclusively that there is no danger in this practice; but, on the contrary, great advantage to both the grower and the consumer of fruits. Many of the pests of the orchard and garden can be kept in check only by this useful, cheap and well-known material. With proper care there need be very little danger in any way from its use; and from its possible absorbtion by any plant there certainly is none whatever. It has been found useful during the past year, not only in fighting the innumerable orchard pests, but has been used on a most extended scale in the State of Massachusetts, where a moth introduced twenty years ago as a producer of silk, and known as the Gypsy moth, has gradually increased until it has now spread over about 50 square miles as a perfect scourge. The Government of the State has appointed a commission to try and exterminate this pest, and in 1890 appropriated $50,000. In 1891 the work was put under the direction of a competent entomologist, Prof. Fernald, and further large appropriations of money were made. Prof. Fernald writes to me that the work is going on very satisfactorily, and that the State is making a magnificent fight with this moth, and that they have the advice of the ablest and wisest entomologists in the country. Up to the present the appropriations voted by the State of Massachusetts since 1890 amount to $175,000.

The value of Paris Green as an insecticide is now recognized all the world over, and it is largely used in England, Germany, France, Australia and India.

DIVISION OF BOTANY.

Some work has been done during the year in augmenting the number of shrubs and trees in the arboretum and in growing native plants from seed. A magnificent collection of seeds of wild plants from the North-West Territories has been received from Mr. T. N. Willing, of Calgary, N.W.T.; and Dr. J. E. White, of Toronto, has also sent seeds of many rare plants found in Ontario. Mr. J. R. Anderson, statistician of the Department of Agriculture in British Columbia, has sent a collection of living roots of ferns from his province, and has also rendered much assistance in sending me specimens and information concerning injurious insects. Prof. Macoun has again sent some seeds of rare plants for cultivation. Some of the above were sown last autumn and the rest will be planted this spring.

Fungous diseases have received such attention as I could find time for. The ammoniacal solution of Copper Carbonate was found perfectly satisfactory for the

Brown Rot of the grape (*Peronospora viticola*), in the vineyard of Mr. J. Lowe; and where, in the year 1890, hundreds of pounds of grapes were destroyed, this year, when treated three times, there were not 10 lbs. of diseased grapes. The use of the Bordeaux mixture in the treatment of the Potato Rot has proved also satisfactory, and I hope during the present season to have facilities for proving to farmers the good effects of this simple remedy.

I have the honour to be, Sir,

Your obedient servant,

JAMES FLETCHER,

Entomologist and Botanist to Dominion Experimental Farms.

DIVISION OF ENTOMOLOGY.

SPRAYING WITH THE ARSENITES.

The great improvement in the quality of American and Canadian fruit, consequent on the adoption of spraying with the arsenites, is very remarkable. Two years ago, through the efforts of Miss E. A. Ormerod, largely helped by the sudden appearance of vast numbers of caterpillars in the orchards of the south of England, the English fruit-growers learnt and quickly adopted this method of fighting leaf-eating insects. Anything so successful as this at once proved to be was naturally taken up readily, and now Miss Ormerod informs me there are numberless spraying machines and patent remedies in the market, all of which owe their existence to the introduction of Paris Green. Mr. C. D. Wise, the manager of the large fruit farm at Toddington, Winchcomb, Gloucestershire, England, writes me under date 19th May, 1890: "We have tried many experiments this season with various insecticides, including Paris Green and London Purple, and we have found that Paris Green is undoubtedly the best. London Purple is inclined to scorch the foliage. Our prospects for fruit this season are on the whole very good, and I think we have fairly overcome the caterpillar, thanks to greasing the trees in the autumn and the use of Paris Green for the past three or four weeks."

Quite recently a London, England, paper, which styles itself a "high-class weekly review," has gained for itself an unenviable notoriety by publishing some untrue and very absurb sensational articles under the heading "Arsenic in American Apples." The first of these was widely copied in the English press and commented upon by the press of this country. It is possible that these articles, having been so widely copied, may have affected temporarily the sale of American apples in the English market; but the English are not as a rule a very gullible race, and particularly is this the case when by such credulity they would be deprived of the very best quality of a commodity which they wish for, and which their common sense will assure them may be safely indulged in, until such time as the safety is proved to them positively by chemical analysis. In a later issue this paper makes it very clear that its whole object in issuing these articles was to get cheap advertisement from its contemporaries. The following headings in this very article speak for themselves: "Our allegations as to the poisonous nature of American apples arrest the attention of dusky fruit-growers in the banana groves of India."—"Our articles appear and are commented upon by the press of every country under the sun."—"We have no doubt we shall be able not only to claim but to prove that our articles have *encircled the earth*."—"We claim that we have a world-wide circulation."

There are several misstatements made, such as the following: "The use of poisonous insecticides by American fruit-growers is upon the increase. They apply them to all kinds of fruits grown, and to such an extent that the authorities have again and again protested"—(N.B.—We are not told where)—"against the danger of the nature of the compounds used. Why, only recently, the New York City

Board of Health condemned grapes in the market that showed signs of poison on the stems and had tons of them destroyed."

"The officials not only had some tons of fruit that has been treated with arsenic in the manner we described seized, but destroyed."

"It is admitted that the American apple-growers are compelled to depend upon the use of arsenic in solution as an insecticide in their orchards; that this insecticide is used upon the fruit itself until it is completely saturated."

This last extract is so utterly ridiculous and false that it will be hardly necessary to say so to intelligent people. It is false that arsenic in solution is used by apple-growers; it cannot therefore be admitted to be the case by any one competent to express an opinion, Paris Green, the arsenite commonly used, being practically insoluble in water. It is also quite impossible for fruit to become saturated with any poison, however soluble, sprayed on it, while it is growing. In his yearning for notoriety the editor becomes reckless, and prints as a proof of how large his circulation is, a perfect refutation of his statements in an excellent article from the *Michigan Farmer*, where it is shown that the grapes seized and destroyed by the New York Board of Trade not only had not been sprayed with an arsenical insecticide at all, but with a carbonate of copper fungicide, quite a different thing; and, moreover, it goes on to say, the editor "does not seem to be aware that the United States Department of Agriculture promptly investigated that grape business, that the fruit was analysed by the most eminent chemists of the country, and the conclusion arrived at, that if a man managed to eat a ton of sprayed grapes he could not get enough poison to ensure a funeral, and that under the showing made, the city of New York had to pay for the fruit destroyed in the mistaken zeal of the Board."

The question of the possibility of poisoning the consumers of fruit or plants has so often come up that entomologists have fortified their position from time to time by getting analyses made, and these all have failed to show a trace of arsenic in the plants treated. On discussing the matter with Mr. Shutt, the Chemist to the Dominion Experimental Farms, we decided that it would be serviceable and reassuring to Canadian fruit-growers if a new analysis were made of Canadian apples, concerning which undoubtedly true data as to their having been actually sprayed could be obtained. As a result, the following letter was written to the *Canadian Horticulturist* for April, 1892.

"Is Spraying Fruit Trees with Arsenical Poisons a Dangerous Practice?

"Sir,—I have received several enquiries from correspondents concerning the foolish and inaccurate statements made upon the above subject, which you refer to on page 83 of your last issue. I therefore beg a little space to submit a few facts which, although well known to many of your readers, may be reassuring to others. In the first place, spraying with the arsenites, through the energy and perseverance of Miss Eleanor Ormerod, the Entomologist of the Royal Agricultural Society of England, is now almost as much practised in Great Britain as it is in this country. It is true that it was introduced as a practical method only two years ago, but through the skill of the introducer, and following the publication and distribution of the report of a special committee, composed of leading fruit-growers, and known as the "Experimental Committee of the Evesham Fruit Growers," spraying with Paris Green is now largely adopted in many parts of the British Isles as the best means of keeping down the ravaging hordes of caterpillars which were rendering futile the labours of the fruit-growers throughout many of the most fertile counties in England. The value of spraying with Paris Green is now fully recognized in England, and will never be given up again for the old methods. As to the possibility of any danger resulting from the practice by the consumption of sprayed fruit, I can only say that entomologists have, with the scientific aid of their colleagues, the chemists, shown over and over again that no danger whatever exists, if only the directions of experienced advisers are carried out. At the meeting of the Dairymen's Association of Western Ontario, held at Brantford on 15th January last, this subject came up, and the absurdity was pointed out of such ideas as you have referred to as published by your English contemporary. As soon as I returned to Ottawa I endeavoured to

obtain apples which had been undoubtedly sprayed in accordance with the instructions given by entomologists, and at last, through your own kindness, succeeded. These, upon receipt, were kindly taken in hand at once by Mr. F. T. Shutt, Chemist to the Dominion Experimental Farms, and analysed with the greatest care. I send you herewith for publication his report. Coming from so high an authority, I feel sure it will be of interest to all fruit-growers."

Here followed Mr. Shutt's results, which are given in full on page 189 of this report. This analysis showed that some Rhode Island Greenings, which were obtained from the editor of the *Canadian Horticulturist*, and which he had twice sprayed in the month of June with Paris Green, in the proportion of 1 lb. to 200 gallons of water, when analysed by a most delicate method, capable of showing one fifty-thousandth part of a grain of arsenic, had it been present, revealed not the slightest trace of that poison. Further, in addition to the above, I may perhaps be allowed to give an extract from my own report to the Hon. Minister of Agriculture, for 1887, page 21:

" Frequent enquiries are made, and occasionally mistatements appear, as to the possible danger of poisoning the consumers of fruit and crops, protected with these arsenical poisons, which it is urged may be absorbed by the plants. These statements, however, are quite inaccurate, as a very elementary knowledge of vegetable physiology will show. Fear is expressed that when apples are treated for the Codling-moth the poison may be absorbed through the stigma and laid up in the seeds. With regard to this statement, it should be remembered that the stigma of a flower is without any epidermis, and is exceedingly delicate, so that any corrosive poison, like arsenic, in even a very weak solution, would be much more likely to injure the stigma than to be absorbed, and further than this, even in the natural operation of fertilization, the stigma is a passive member, and absorbs nothing. The activity is on the part of the pollen, which pushes out its fovilla-bearing pollen-tubes and protrudes them through the tissues of the stigma, down the style into the ovary." In corresponding on this matter, Prof. Forbes says : " Of course, you will have no trouble in proving by the highest authority that there is no possibility of the poisons being absorbed by the plants," which statement, with the following letter from Prof. A. J. Cook, should, I think, set this contention at rest:—

" I experimented twice extensively to find out the truth—first in 1880, when I had fifty apples analysed, which were very thoroughly sprayed ; poison was carefully thrown on each fruit—with one pound of pure Paris Green to 50 gallons of water—four times as strong as necessary—in May. Chemical analysis in August found not a trace of poison. Another lot of fifty was analysed with the same result."

In short, all analyses have shown that practically there is no danger whatever in spraying fruit trees if ordinary common sense precautions are taken. In conclusion, let me add the following extract taken from the Boston *Transcript* of 1st January, 1892, which is a report of a lecture delivered by Prof. C. V. Riley, the United States Entomologist, undoubtedly the most eminent economic entomologist living :—

" The conclusion of the lecture was particularly appropriate and reassuring, as it dealt with the possibility of danger in the use of arsenical poisons, and the lecturer showed how perfectly safe and incapable of harm they are, if used intelligently and in accordance with the recommendations of those who had large experience in their use. He referred to the scare of last autumn in reference to grapes that were supposed to have been poisoned by spraying, and exposed for sale in New York city, and stated that the alarm, as the Department of Agriculture had showed, was entirely unjustified. 'In no instance,' said Professor Riley, 'is there an authentic case of poisoning through the use of plants or fruits that have been treated, and I wish to emphasize this fact, because almost every year there are statements in the press that are well calculated to alarm and engender the belief that we are in danger of wholesale poisoning by the increasing use of these arsenites.' The latest sensational report of this kind was the rumour, emanating from London, within the last week, that American apples were being rejected for fear that their use was unsafe.

If we consider for a moment how minute is the quantity of arsenic that can, under the most favourable circumstances, remain in the calyx of an apple, we shall see at once how absurd this fear is; for even if the poison that originally killed the worm remained intact one would have to eat many barrels of apples at a meal to get a sufficient quantity to poison a human being. Moreover, much of the poison is washed off by rain and some of it thrown off by natural growth of the apple, so that there is as a rule nothing left of the poison in the garnered fruit. Add to this the further fact that few people eat apples raw, without casting away the calyx and stem-ends, the only parts where any could, under the most favourable circumstances, remain, and that these parts are always cut away in cooking, and we see how utterly groundless are any fears of injury, and how useless any prohibitive measure against American apples on this score."

THE EYE-SPOTTED BUD-MOTH.

(*Tmetocera ocellana*, Schiff.)

Attack.—Early in the spring, a small, dark brown, caterpillar, about ¼ inch in length, with head and collar black, and having the body dotted with small protuberances, each of which bears a slender short hair, is found destroying the fruit buds of apple, pear, plum, and some other trees belonging to the large Rose family. Frequently, having destroyed the flower buds, these little caterpillars do much harm by boring down the centre of the twig.

In 1885 I found in Nova Scotia some small larvæ, enclosed in silken cells, which they had spun in the roughnesses of the bark of fruit spurs upon apple trees. Upon one or two occasions last year the method of passing the winter of this insect was discussed at scientific meetings, but there seemed to be doubt about the matter. This winter I have made careful search upon apple trees and upon some twigs, which were sent to me by Dr. Young, bearing the larvæ of a small Coleophora. In every case I have been able to find the larvæ of this moth enclosed in small silken cells, covered over with, apparently, the excrement of the caterpillar, so that I am convinced that for this part of Canada and Nova Scotia, this is the usual mode of passing the winter. In early spring these small caterpillars leave their cells and crawl to the nearest opening buds and begin their aggravating work of destruction. Later they attack the leaves, two or three of which they attach together. During the past season the Eye-spotted Bud-moth has been very abundant, so much so that it has probably been the most notable injurious insect of the season. During May and June many letters were received:

"May 6.—I send you to-day apple-blossoms. You will find in them a small, black worm, which is cutting them before they open. These blossoms were picked off my place in the township of Grantham, county Lincoln."—F. G. Stewart, *Homer*, *Ont.*

"May 25.—Enclosed find specimens of leaves containing little, brownish-coloured grubs. They are found near the points of twigs of both plum and apple trees. They are sometimes found in a little whitish covering, surrounded by a curled leaf. They are quite numerous, as many as half-a-dozen being taken from a two-year-old tree."—F. Mulholland, *Yorkville*, *Ont.*

"May 25.—I send you a few peach buds, which have been destroyed by a small, brown worm, from ⅛ to ⅜ of an inch in length. They seem to be more destructive on the smaller and younger trees than large ones. We also find the same worm in both plum and pear trees. My neighbours are also noticing them in their trees." —Geo. Lentz, *Bartonville*, *Ont.*

"May 28.—The bud-moth, of which I spoke to you in a former letter, has been exceedingly abundant in this section this spring, every tree being disfigured by its attacks. I think we must be careful to take steps to destroy it another spring, or it will materially lessen our crop of apples, pears, quinces and peaches."— L. Woolverton, *Grimsby*, *Ont.*

"June 19.—The apple bud-worm, which I find plentifully destroying the blossoms on my trees, is not confined to any one kind. It is even on the quinces."—Rev. F. J. H. Axford, *Port Williams, N.S.*

"June 17.—By this mail I send you samples of a worm that is not generally known here; in fact, I have not observed it before. These were taken from a garden at Port Williams, and I hear of it in several other localities. The owner of the garden where I got these, says he has picked and burned about a peck of these leaves containing worms. They seem to roll and seal themselves up in the leaf, which becomes dead and dry. In some cases they eat the young wood. I shall be glad if you can give us any information about this pest, which may prove troublesome. I have advised Paris Green. Your Bulletin 11 is to hand, and is what was wanted by everyone."—C. R. H. Starr, *Wolfville, N.S.*

"June 31.—I send you enclosed in a box some caterpillars taken from my cherry trees, to which they are doing much harm by destroying the blossoms and buds; they are also in the apple buds, and are much more plentiful than last year. Some Gravenstein trees show quite a brown appearance, and they have killed a large percentage of the blossoms, so that the trees will have but a small crop of fruit."—E. E. Dickie, *Cornwallis, N.S.*

From the fact that the larvæ pass the winter half-grown, on twigs, they are able to do a great deal of harm by attacking the buds and boring into them early, before the leaves unfold. The only remedy that can be recommended is to spray the trees directly the buds open, and again after the flowers have fallen. Kerosene emulsion sprayed three times over trees, upon the twigs of which they were in winter quarters inside their silken tubes, had no effect upon the larvæ, having failed apparently to penetrate through the silken covering. Although like the Leaf-rollers they enclose themselves in cases made of leaves drawn together, they have to continually draw in fresh material, and I found last season that where an orchard was severely attacked at the same time by this insect, the Canker-worm (*Anisopteryx pometaria*, Harris), the Lesser Apple-leaf Roller (*Teras malivorana*, Le B.), and the Oblique-banded Leaf-roller (*Cacœcia rosaceana*, Harris), all were much reduced in numbers by a single spraying with Paris Green.

The moth is of an ashy grey colour, with a milky-white blotch on each wing. The eggs, which are remarkably flat, are laid in July, and the young caterpillars grow very slowly, and pass the winter half-grown on the twigs, and, according to Prof. Fernald, also on the ground amongst the fallen leaves.

Note.—Upon applying to Prof. J. H. Comstock for his experience, as to the hibernation of this insest, he kindly requested his assistant, Mr. Slingerland, who has made a special study of the Eye-spotted Bud-moth, to write to me on the subject. Since the above was sent to the printer, Mr. Slingerland has very kindly sent me a complete record of his observations, which I trust will soon be published. I am permitted to say that his experience entirely confirms my own, the larvæ leaving the leaves in September when half-grown, and spinning upon the twigs winter shelters, whence they emerge the following spring and attack the opening buds.

THE CIGAR CASE-BEARER OF THE APPLE.

(*Coleophora*, New Species.)

Attack.—Small orange-coloured caterpillars with black heads and dark feet, encased in brown leathery cigar-shaped cases, which they carry about with them. They attack the leaves of apple, pear and plum trees, by eating a small hole through the epidermis and then feeding on the *parenchyma* or soft substance of the leaf, which lies between the upper and lower surfaces, protruding their bodies a long way out of the cases, and eating for some distance around the central hole. When they have consumed all they can reach they move to a fresh place and make another hole. The brown cases are very tough and have some of the hairs from beneath the leaves attached to them exteriorly; at the upper end the case is contracted abruptly into a 3-limbed-star-shaped orifice, the lips of which fit closely together—through this hole the excrement is ejected and ultimately the moth makes its exit. The

larvæ and the slender dark brown chrysalides are about four millimetres in length, the case six millimetres. There is only one brood in the season. The small shining, steel-grey moths appear at the end of July and the beginning of August, and lay eggs which hatch the same season and make about ¼ their growth before winter sets in. After feeding for a time, they fasten themselves to the bark of the tree and remain dormant till spring, when they revive and attack the new foliage.

This insect was first brought to my notice in 1889, when the late Mr. Wm. Brown, of Charlottetown, P.E.I., amongst others, sent me some larvæ from his plum trees, upon which they were abundant. Mr. Brown had also found them upon one "Brockworth Park" pear tree and upon some apple trees. In June last, Dr. D. Young, of Adolphustown, sent me specimens and wrote ;—

"June 14.—I send you to-day some small caterpillars in their cases; one end of the case is open, and the caterpillar seems to fasten to the apple leaf and then feasts away upon it. Most of the leaves of the Duchess, Golden Russet, Northern Spy, Talman Sweet, &c., have them upon them, and often half a dozen on a leaf. They are here by millions and are destroying the leaves rapidly. We have been spraying them this week with Paris Green (1 lb. to 200 gallons), and think that a portion of them are gone from the leaves of trees sprayed a couple of days ago."

"June 24.—Having examined the worm and its work under the microscope I found that it fed chiefly on the inside of the leaf; but that, to reach that part, it ate a little of the epidermis first, every time it attacked a fresh part of the leaf, which seems to be frequent; we therefore from this fact determined to use Paris Green, and we gave the trees a most thorough spraying. After the spraying, I thought, more than before it, they seemed in almost every case to move and attack a new part of the leaf, and wherever they did so they seemed to have just commenced operations and died, for they scarcely made a mark on the leaf. They are mostly gone, yet there are thousands fast to the leaves, but they are dead. They attacked about 1,000 Duchess of Oldenburgh trees, and had they continued a few days longer I believe they would have destroyed the foliage and crop. They are most voracious feeders."

Dr. Young sent me frequent consignments of these larvæ, and although many were dead in the cases, at the same time there were a great many that had formed the chrysalis, and from most of these the moths emerged later. Dr. Young also very kindly took much pains to advise me regularly how the insects were developing. He writes October 3: "I find the young worms are, as you anticipated, on the underside of the leaves. There is one or more on almost every leaf, sometimes only on every 5th or 10th leaf, but pretty plentiful. They are also in the forks of the branches as well as on the leaves."

This last mentioned habit must, I think, be the usual method of passing the winter; none could be found on the fallen leaves 18th November. Upon several lots of twigs sent me at different times during the winter I find the young larvæ in thousands. Being anxious to find out whether they might not be treated during the winter in a wholesale manner, I asked Dr. Young to spray some trees with Kerosene Emulsion. This he kindly did in a thorough manner, and then sent me the twigs about a fortnight afterwards. On 14th December he writes: "I now send you a package of the young caterpillars. The trees off which they were taken were sprayed 25th November; a light shower came that night, so I sprayed again 2nd December with Kerosene Emulsion. If you still wish to have the emulsion used warm, I shall be pleased to try it. In every alternate row of trees (among the Duchess) I have Golden Russets of the same age (17 years). The Russets had very few apples on them, so we did not spray them with Paris Green last season, and I am now satisfied that the caterpillars are many times more numerous on the Russets than on the Duchess of Olden burghs. I think the Paris Green spraying last summer killed the greater proportion of those on the Duchess and that the dead ones must have fallen from the leaves, for they seemed so much less in numbers afterwards."

They were again sprayed later, as here recorded: "8th February, 1892.—I again send you some of the case-bearers in one package containing two small boxes. The flat box contains those sprayed with very warm Kerosene Emulsion. Those in the

top of the round box, above the division, are sprayed with cool emulsion, and those in the bottom of the round box were not sprayed. The reason that I enclose the last is that we have had some very cold weather, 30° below zero, and I hoped it had injured the worms. The trees that were sprayed were done 19 days ago, but there was ice on the trees and I could not very well collect them before."

The cold had in no way, however, inconvenienced these hardy little enemies of the orchard. Upon receipt of the sprayed twigs they were found to be covered with the small case-bearers. The odour of the emulsion was quite strong, but most of the larvæ were still alive. My thanks are particularly due to Dr. Young for the very careful manner in which he has tried every experiment I have suggested and has at great trouble written the full accounts of the progress of the work. Upon enquiring from him when these caterpillars first appeared, he says: "We did not notice the case-bearers last spring till they had done great injury to the leaves. The apples on the Duchess trees were then about the size of pease, and the trees heavily loaded; my brother then came and told me that the leaves were badly eaten. We examined and found the case-bearers. My brother, whose time is occupied in the orchard, says that he has seen them for six or seven years, but not so many of them. Speaking safely, I think they caused a loss of one-half of the crop, for this was the best bearing year, and we had only 458 barrels, whereas we have had from 800 to over 1,000 barrels off the same trees. Besides this, the apples were not at all as good as formerly."

I received also specimens of this same insect in July from Rev. F. J. H. Axford, of Port Williams, Nova Scotia, where it had occurred in small numbers. It has however, as far as I can learn, nowhere else occurred in the devestating numbers recorded by Dr. Young.

From the above experience, spraying with Paris Green, 1 lb. to 200 gallons of water, directly the leaves begin to unfold, and again after the flowers have fallen, would probably be the best remedy. I bred a few chalcid parasites from the cases; but unfortunately they have been mislaid.

THE PEAR-LEAF BLISTER.

(*Phytoptus pyri.*=*Typhlodromus pyri*, of Sheuten.)

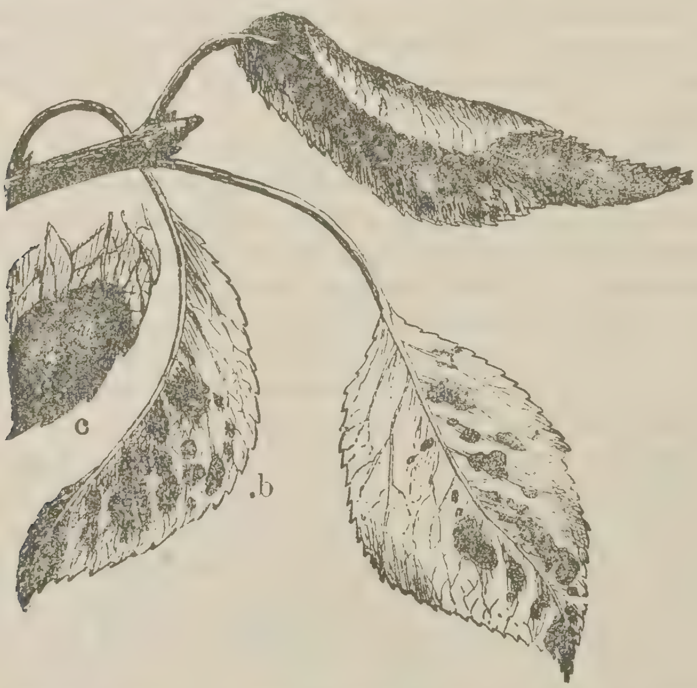

Fig. 5.—Cluster of infested leaves: *a*, upper surface of leaf; *b*, lower surface; *c*, two galls enlarged. (Figure kindly lent by Prof J. H. Comstock.)

Attack.—Reddish spots, irregular in shape, about ⅛ inch in diameter and frequently confluent. These appear on young pear trees early in spring, and as the

summer progresses they turn to corky blister-like galls, with a hole in the centre, through which large numbers of minute mites issue and attack fresh parts of the leaf.

I am not aware that this injury to pear trees has ever as yet been recorded in Canada; but I find that it is very widespread and serious. Four years ago I received specimens from River John, Nova Scotia, and during the past summer it has come in from several different localities. It is a European insect, and has doubtless been imported with pear trees.

"May 28, 1889.—The enclosed pear leaves were gathered off a pear tree in the garden. I noticed the young pear trees had their leaves flagging, and upon enquiry was told that it was a blight, and no one knows it nor how to cure it. Is this the case?"

"October 15, 1891.—I send you some more of the pear leaves. They are not nearly so much diseased this year as usual."—Mrs. W. G. Schreiber, *Springfield-on-Credit, Ont.*

"June 22.—I mail to your address some infested pear leaves. The disease is different to our common enemy *Fusicladium*. This trouble has been quite common in our pear orchards and spreads rapidly under favourable circumstances."

"July 13.—Enclosed I send some more diseased pear leaves, as requested. This trouble on the pear leaves, not directly injuring the fruit, we have given it but a casual passing notice. But every year it is growing worse, and on many of the trees this year the foliage is so impaired that the vigour and health of the trees are very much injured."—J. K. MacMichael, *Waterford, Ont.*

"July 14.—I send pear leaves attacked, I suppose, by insect or fungous disease."—Rev. F. J. H. Axford, *Cornwallis, N. S.*

"August 24.—Some kind of blight has been affecting the pear trees in my orchard for the past two or three years. I enclose some leaves, and should be much obliged if you could inform me of the cause of the appearance of these leaves, and also if there is any remedy. A good many of the trees are dying off, and I cannot attribute this to any other cause than the blight."—Chas. A. Holmes, *Richmond Hill, Ont.*

"September 8.—I enclose you some diseased pear leaves sent to me from near London. Would you be kind enough to tell me what the trouble is with them. I have seen the same before, and understand the insect to be a very small mite." L. Woolverton, *Grimsby, Ont.*

This injurious disease, which has spread unnoticed over the Dominion and much of the United States, has not been treated of by many of our North American entomologists, although the mite was figured by Glover (U. S. Agric. Rep. 1872) and mentioned by Riley (Am. Ent. III, p. 26), and Osborn (Ag. Col. Iowa, Bul. 2, 1884). Prof. J. H. Comstock, in Cornell University Bulletin XXIII, December, 1890, gives a full and well illustrated account of this pest, and in the Handbook of Destructive Insects of Victoria (Australia), by C. French, F.L.S., F.R.H.S., the Government entomologist, is also another good account, illustrated by a coloured plate, giving its history in the Australian colonies.

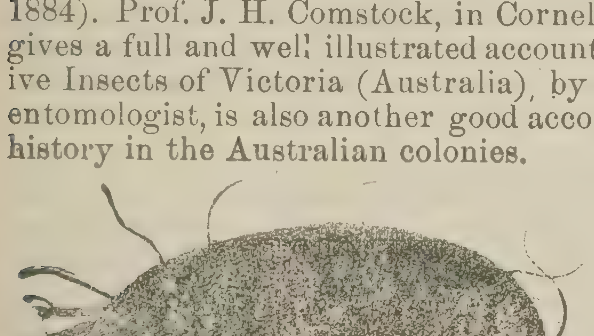
Fig. 6.—Adult mite.
(Kindly lent by Prof. J. H. Comstock.)

The cause of this disease, which, until it is examined, is as a rule attributed to the attacks of some fungous parasite, is a very minute insect belonging to the gall mites, *Phytoptidæ.* It is a very small insect indeed, with an elongated body, shown very much enlarged at Fig. 6; it is so exceedingly small, .12 mm., that it requires to be examined under a microscope. The life history as sketched by Prof. Comstock is as follows:—

"*Life history of the Species.*—The eggs are laid by the females within the galls that they have formed and here the young are hatched. How long the young remain within the gall of their parent has not been ascertained; but sooner or later they escape through the opening in it, and seeking a healthy part of the leaf work

their way into the tissue, thus starting a new gall. By this spreading of the young from the galls in which they have hatched and starting new ones, the number of galls on a tree may become rapidly multiplied. The mites live within the galls till the drying of the leaves in the autumn; then they migrate to the leaf buds at the ends of the twigs, where, after working their way beneath the leafy scales, they remain throughout the winter."

No satisfactory remedy has as yet been hit upon for this pest. Prof. Comstock's experiments showed that Kerosene Emulsion sprayed on the leaves was not satisfactory, and all that can at present be suggested is spraying freely with Kerosene Emulsion at the time the buds burst in spring. It is difficult to mix any powder with Kerosene Emulsion, but this can be done with care, and Flowers of Sulphur would certainly be a valuable addition on account of its special efficacy in destroying mites.

THE CLOVER ROOT-BORER.

(*Hylesinus trifolii*, Müller).

Attack.—Small, brown beetles, shown magnified in the figure, which bore into the roots of clover and deposit eggs there; these eventually turn to white grubs and destroy the root of the clover plant.

Fig. 7.

This troublesome insect is now well known in some of the States of the Union; but has never, to my knowledge, been before this year found in Canada. In August last I received from the editor of the *Farmers' Advocate* the following letter, to which I replied as below:—

"Sir,—I send you by parcel-post specimens of red clover roots infected by insects, and black knot taken from cherry trees, with the worms still in them. There are two broods of the clover insect in a season, the first becoming a beetle and leaving the clover roots about the first of July, and the other about the time the red blossoms should develop for the second crop; but if the insects are numerous, there are no red blossoms, and I think they may have been the cause of the almost total failure of the crop of clover seed in this section for a number of years.* As to black knot, I am satisfied that it is caused by insects, and that the fungus exists only in the cranium of those so-called professors who argue otherwise. If they examine the knots the fore part of July they will find from one to ten maggots in each, without any openings to get in. There are openings now, as they are about to leave the knots, which dry up and make no further growth, and the insects do no more harm. If the knots are not destroyed before the insect escapes, it is useless to do so after."—(S. A. Arnold, *Harwich Township, Ont.*)

"Sir,—I now send you a short article on the beetle which was destroying Mr. S. A. Arnold's clover. Mr. Arnold's opinion concerning the nature and origin of black knot of the plum and cherry is entirely wrong. The nature and mode of growth of this parasitic fungus are now just as well known as that of the plum tree upon which it grows, and it has been ably treated in your pages by Prof. Panton. It is a rather new kind of argument that because an insect is found inside an object that, therefore, it made it. In the same line would be trying to prove that because maggots are found inside the ordinary mushroom that, therefore, they made the mushroom. There are no holes showing on the outside, because, when the insects hatched from the eggs laid by the mother insect, they were so very small that the hole necessary to allow them to enter the substance of the fungus could hardly be seen, and also because its increase of growth would soon obliterate the holes. (The eggs might also have been inserted in the substance of the gall by the female insect.)

*Note.—It is very evident that the gentleman is here confounding two insects—the Clover-seed Midge and the Clover Root-borer.

"The Clover-root Borer (*Hylesinus trifolii*, Müller).—The clover roots sent by Mr. Arnold were found to be badly infested by the Clover-root Borer, which was present in the grub, chrysalis and perfect states. The perfect beetle is a very small dark brown beetle, only $\frac{1}{12}$ of an inch in length. It belongs to the family known as Bark-borers or *Scolytidæ*, all of which are rather slow-moving and small insects: most of the species in this family live in and beneath the bark of trees, where they do much damage. The insect under consideration is a new pest in Canada, originally imported from Europe; it has only been complained of in North America since 1878, when specimens were sent to the United States Entomologist, Prof. Riley, from the State of New York. It has, however, already spread over a considerable area, and is now a formidable enemy of the clover grower. In order that the insect may be recognized by farmers, I give herewith an illustration of the insect in all its stages, which has been drawn with great care by Prof. Riley. All the figures of the insect are much enlarged, the actual size being only about that of the letter "a" by the side of the stem. (Fig. 7.) The life-history is as follows: Early in the spring the mature beetles emerge from the ground, where they have passed the winter in the roots of the clover plants, which they had destroyed the previous season. After pairing the female bores a cavity in the crown of the root and deposits there about half a dozen small white eggs. These hatch in about a week and eat their way down into the root, hollowing it out, as shown in the figure. The burrows are filled up with the excrement of the small white grubs (Fig. b.), which, when full grown, are only about $\frac{1}{10}$ inch in length. These change to chrysalides, and in September the perfect beetles may be found in the roots. In the specimen sent by Mr. Arnold I found full grown grubs, chrysalides, and the perfect beetles.

"These would all have attained the perfect form before winter, and remained in the root until spring, feeding upon its substance. Although the perfect beetle feeds on the roots, it is in the grub state that the chief injury is done. When the larger roots are particularly attacked, Prof. Riley found that in many cases the plants were entirely cut off at the surface of the ground, and the flower stalks were in many cases eaten into.

"*Remedy.*—No better remedy has been suggested than the ploughing under of clover when it is found to be infested. As a rule, this is not detected until the second crop is found to fail. In infested districts the fields should be examined frequently, and if indications of the pest are found, the clover should be ploughed under as soon after the first cutting as there is a pretty good growth on the ground. The value of the clover plant as a fertilizer is well known, so that the loss to a farmer is materially reduced on that account, when this treatment is found necessary. When Gas-lime can be had cheaply and conveniently it will render the treatment much more thorough if a heavy application of from two to four tons to the acre be made previous to the ploughing."

AN OAT WEEVIL.

(*Macrops porcellus*, Say.)

Attack.—A white, legless maggot, burrowing in the bases of the stems of oats, leaving the plant when full grown and penetrating into the ground a short distance to pupate, emerging three weeks later as a small brown weevil with mottled wing covers.

In walking through an oat field on 10th July I noticed that several of the stems had a faded and yellow central leaf, an attack similar to that of *Meromyza Americana* upon many grasses. This latter insect is reported by Prof. Cook as injuring oats severely in the State of Michigan, so I was very curious to see if I had at last found it here, where, although it is a very active enemy of grasses, barley, wheat and rye, I had never found it in oats. Upon taking up some of these stems I was much interested in finding an attack quite unknown to me. The base of the stem had been entirely eaten out by a footless, yellowish-white grub, $\frac{1}{4}$ inch in length, with a chestnut-brown head and the posterior end of the body becoming rapidly smaller at the last two

rings. On taking the grub from the oat stem it progressed quickly across a table, working itself along by moving the rings of its body like a dipterous larva and at the same time making use of its slightly extensile tail to push itself along. The next day the same larvæ were found in the stems of *Panicum Crus-galli*, a very succulent grass. When full grown the larvæ left their food plants, and burying themselves in the soil formed oval chambers and changed to small beetles, which were afterwards identified for me by Mr. A. E. Schwarz, of Washington, and also by Dr. John Hamilton, of Allegheny, Pa.

This, I should judge, is not likely ever to develop into a serious pest of oats. It decidedly showed greater preference for the wild grass, *P. Crus-galli.*

RED TURNIP-BEETLE.

(*Entomoscelis adonidis*, Fab.)

Attack.—A showy scarlet beetle, with three black stripes down its back, a black patch on the collar and black legs. Two-thirds the size of the Colorado Potato Beetle, but narrower in outline. Eating the leaves of turnips, radishes and cabbages.

In August, 1885, I found upon the farm of Messrs. Cowdry Bros., at Regina, North-West Territories, sufficient specimens of this beetle to convince me that at any time it might develop into a troublesome pest. As then noted, this beetle also occurs in Europe, and I can see no difference between our specimens and some in my collection from Austria. It has every appearance of being a native insect. Since 1885 I have received no complaints of this beetle; but the following extracts will show that it can develop into a serious crop pest. From corresponding with the settlers through the district I judge that the injury is done by the adult beetle only. I have been unable to learn as yet its life history.

"July 20.—I enclose you some beetles and wish to ask if they are of a harmful kind. At present I only find them on turnips and cabbages, but they may spread further."—G. D. Fitzgerald, *Grenfell, N.-W.T.*

"August 8.—I send you by mail specimens of a beetle that has for about three weeks been feeding on the leaves of radishes; they are so numerous as to have half stripped the leaves from all the radishes and have cleared some to the stalk; we have noticed some feeding on the turnip-tops, but not to do any noticeable harm. Are they likely to give much trouble, and if so, how shall we destroy them?"—J. A. Smith, *Saskatoon, N.-W.T.*

"August 10.—Please inform me what the enclosed insects are. I picked them off my turnips, which they have eaten the leaves off bare, only leaving the large ribs. I have noticed that such turnips as have been stripped have ceased growing."—Isaac Jones, *Pheasant Forks, N.-W.T.*

"August 11.—I am sending you some beetles somewhat like lady-bugs, found on our turnips. They are doing considerable damage to the Sweet German turnips and a little to the other white turnips, but do not touch Swedes. I propose trying Paris Green in water."—S. A. Bedford, *Brandon, Man.*

"August 12.—I send you herewith some red insects, of which we have thousands on our turnips. Kindly give me some account of them."—Rev. F. R. Hole, *Halse, Minnedosa, Man.*

Upon enquiring later whether the beetle had bred upon the turnip leaves, Mr. Hole wrote:—"The beetles appeared in July in full force on our turnips; they ate through the leaves a good deal, but the roots did not seem to suffer much. I did not notice any soft-bodied grubs such as you describe."

"Yours received; would say the beetle you speak of did not breed or lay eggs on the leaves, as far as I could see; saw only the beetles."—Wm. H. Weston, *Lorlie, Man.*

"Although hundreds of the beetles were working on the radishes and a few on turnips near by, I believe none of them bred. I have also enquired of a neighbour who had them in the garden, and find that they did not breed there either."—Joseph A. Smith, *Saskatoon, N.-W.T.*

"The Red and Black Beetle in all its habits, except as to food, seemed to me so like the Colorado beetle that I had mentally been calling it *Doryphora rubra-trilineata.* The prevailing colour is red; there are three heavy black lines along the wing covers, the middle lines being made up one-half from each wing cover. It feeds on leaves of turnips and radishes, and where it can get a choice it prefers the latter, sometimes covering a radish plot in swarms. I have picked over 500 from a space five yards long, off a single row of radishes, and in two days they were almost as plentiful as ever. They also prefer the rough-leaved to the smooth-leaved turnips. Ruta-bagas or Swedes are very little meddled with if white turnips or others with rough leaves are growing alongside. I discovered no natural enemies. I watched carefully, as far as time would allow, for the eggs or larvæ of the beetle on the leaves of the radishes and turnips which were its favourite food, but in no instance found either. Some of the radishes if neglected for a day or two would be completely stripped. Some of the female beetles were very big, so big that I expected eggs, and not finding any I thought they must have been deposited in the ground. I know the beetles burrow; but cannot say where the eggs are deposited."—Thos. Copland, *Saskatoon, N.-W.T.*

This insect should be watched carefully by north-western farmers, and on their appearance in July the infested crops should be at once sprinkled with Paris Green, in the proportion of 1 pound to 100 gallons of water. I shall be obliged if some of my correspondents will next July send me specimens alive, so that the life-history may be worked out They may be easily sent by putting one or two pairs into a small tin box with some turnip leaves. These latter should be allowed to fade a little before putting in the box or they will rapidly decay. The boxes for sending insects by mail must not have any holes punched in them, or the food plants and insects will soon dry up and perish.

THE PEA WEEVIL.

(*Bruchus pisi*, L.)

A small, brownish-grey, very active beetle, $\frac{1}{5}$ inch long, with two conspicuous black spots on the end of the body, which emerges from seed pease in autumn or in spring, leaving a small round hole. The egg is laid on the young pod and the grub eats its way into the pea, where it passes all its stages, emerging the same autumn or the following spring.

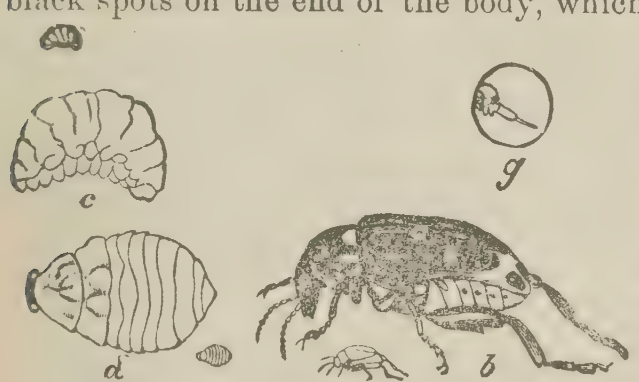

Fig. 8.

Reports from the pea-growing districts early in the season were to the effect that there was far less of the Pea Weevil than last year. Lately, however, I find this to have been a mistake, and a report from Prince Edward county, one of the best pea-seed growing districts in Canada, says: "I am very sorry to report that they are greatly on the increase. Lots coming from the central parts of the county are usually worse than those from the outskirts or from near the water. In some lots grown near the lake there is scarcely a weevil to be found. Certain varieties of peas are more infested than others, as the White-eyed Marrowfats, Forty-folds, and Golden-vines. The Early Kents had some, but the Runner peas have scarcely any. In the line of Runners, Black-eyes, and Golden-vines, farmers raise and keep most of their own seed."—T. G. Raynor. *Rose Hall, Ont.*

There was considerable excitement caused in Renfrew county, Ont., last spring, by the introduction of a large quantity of seed-pease, amongst which there were found to be some living weevils. A correspondent, who does not wish his name mentioned, wrote as follows:—"I herewith enclose you samples of pease containing some kind of a bug or grub, and would like to have you identify it. About 3,000 bushels of these pease have been imported from the United States, to be grown here,

and a great many are afraid to sow them on account of this bug. In a great many cases the bug is dead, but in others it is not. What would you advise us to do? Is the bug a dangerous one? Would it be better for no one to sow the pease for fear of introducing the insect into the country. I send you by mail a sample of the pease just as they are in the bag, also a sample of those destroyed by the weevil. This seed has been imported by one of our leading seedsmen, and it would be a benefit to every one if the experiment could succeed. The owner supplies the seed and the growers return it to him in the fall, and he gives them 75c., $1, or $1.25 a bushel for the rest, according to the variety. They are to be hand-picked, and it is said it will keep between forty or fifty women busy all the winter. So you see, if they do well it will be a good thing all round, for the farmers, the village, the seed-dealer who introduced the seed, and the United States owner of the seed. I would suggest your writing a letter for the local paper regarding this pest. Possibly it may not live in this climate, as a great many of them are dead. I found a few alive, which I sent you, and one of my neighbours says he saw them as soon as they got to the heat come right out and fly away."

In response to this suggestion I prepared the following letter, and sent it off to the Renfrew *Mercury*, and it was printed on 8th May last:—

"WEEVILLY PEASE.

"*To the Editor of the Renfrew Mercury:*

"DEAR SIR,—I have received two letters from your district enclosing samples of seed pease infested by the Pea Weevil, and asking if it would be safe to sow these for seed. I am also informed that a considerable quantity of similar seed has been sent to your district to be grown for seed during the coming season. I write at once to warn farmers that unless seed is treated before sowing, it will be a very dangerous experiment to introduce this insect into your district. Although it is possible that the weevil may not survive your severe winters in Renfrew county, it must be remembered that this is the worst enemy known of the pea crop, and if the weevils are introduced into your fields with seed sown this spring, the crop grown this year will almost certainly be badly attacked.

"The following is a brief sketch of the life-history of this pest: The egg is laid by the female beetle on the young green pod. As soon as the grub from this hatches, it eats its way in through the pod into the nearest pea, where it remains until full-grown, consuming the interior of the pea and passing through all its stages, from a white fleshy grub to the chrysalis, and then to the perfect insect. Some of the beetles escape from the pease in the autumn and pass the winter hidden away under rubbish or about barns or sheds. The greater number, however, emerge from the pease the following spring, and as soon as the pease are in flower fly to the fields and lay their eggs on the forming pods.

"I have been asked if anything can be done to kill the weevils before the seed is sown. Under the circumstances, I would advise the following remedy: Half fill a barrel or large wash-tub with hot water, not actually boiling, but hotter that can be borne by the bare hand. Pour the pease directly into the hot water, which will instantly kill all the weevils that may have emerged from the pease. Then fill up at once with cold water, which should be standing ready close at hand. The seed should be left in soak, entirely covered with water, for 12 hours, when all the beetles in the pease will be killed. If the seed is to be sown by hand this may be done at once, after pouring off the water, and its growth will be much hastened by the soaking; but if it is to be drilled, it must be dried again or the drill set to allow the swollen pease to pass through freely. To dry the seed after soaking, spread it out thinly on a barn floor or on a large canvas or cloth out of doors, so that it dries up quickly."

The publication of this letter very soon brought in other letters and several samples of pease. From these latter I found that very nearly all the weevils were dead, and upon enquiry from the seed-dealer and shipper I found that the whole stock had been treated in the usual way with bi-sulphide of carbon before shipping.

This being the case, I felt justified in writing again to the Renfrew *Mercury* stating that this was the case.

That there were living weevils even only in small numbers, however, made care on the part of the farmers, as advised above, very necessary.

There are some fallacies current about weevilly pease which it may be well to refute:

1. *Weevilly Pease Floating.*—It is frequently stated that weevilled pease can be detected by throwing the seed into water, when they will float on the top. This is not the case, as everyone can prove for themselves.

2. *Warm Storage Remedy.*—It is also often advised that seed-pease should be stored in a warm room all the winter, so that the weevils may emerge during the winter and die. During the past season I have proved that this remedy is useless. I placed samples of about a quart each in glass jars in my office in January, 1891. They were kept in the heated office and examined frequently. Weevils continued emerging until well into June, long after the seed would have been sown in the field. This, then, makes the remedy of holding over seed until the next year the only reliable, simple remedy. I have found that seed pease may be safely held over for this length of time without losing their vitality. Two-year-old Black-eyed Marrowfats gave in two samples, respectively, 100 and 97 per cent of strong plants. Goldenvines of same age gave 97 per cent, Multipliers gave 99 per cent.

3. *Weevilly Pease as Seed.*—The statement is often made that pease which have been infested by Pea Weevil are almost as good for seed as sound grain. To test this (i.) One hundred injured pease were picked out indiscriminately and sown in the open ground in June. Of these 17 grew and appeared above ground, 2 made strong-looking plants and produced seed; all the others were stunted and weak. (ii.) One hundred were selected which had the radicle injured by the weevil in boring its way out of the grain. None of these grew. (iii.) One hundred were selected which had the hole away from the radicle. Sixty-two of these grew, but the plants were plainly weaker than others grown from sound seed alongside of them.

Two measured pints of a sample of pease grown in 1891 were carefully tested with the following result:—No. 1 gave 717 uninjured seed, 413 injured (none of which grew), and 64 injured seed which germinated. No. 2, 613 uninjured, 479 injured (none of which grew), and 49 injured, which germinated.

Two samples of two-year-old Golden-vine pease which had been injured by weevils, on being tested in the conservatory gave 9 per cent of sprouted grain in the seed tester and 8 per cent in the soil.

These tests then show plainly that weevilly pease do not answer for seed.

I have as yet never succeeded in breeding any parasite from the pea-weevil.

DIVISION OF BOTANY.

SMUT IN SMALL GRAIN.

Fig. 9.

The great damage by Smut to the immense wheat crop of the Dominion during the year 1891 has caused much enquiry from farmers. The Department of Agriculture for Manitoba has just issued a timely bulletin upon the subject. In a letter from Mr. A. Mackay, Superintendent of the Experimental Farm at Indian Head, he says: "I think too much cannot be known regarding Smut, and anything you could put in our papers cannot but be of value to the farmers. I think every bushel of seed will this spring be treated for Smut, and it is important that the best way should be known how to treat it effectually." In compliance with the above suggestion, I immediately wrote the following letter to the *Farmer's Advocate*, which has a large circulation in the North-West Territories and Manitoba.

There are two kinds of Smut which attack wheat. These are shown at Fig. 9, which is the Loose Smut of wheat, and Fig. 10, which shows a smutted grain of wheat attacked by the Hard Smut of wheat, also known as "Bunt" or "Stinking Smut."

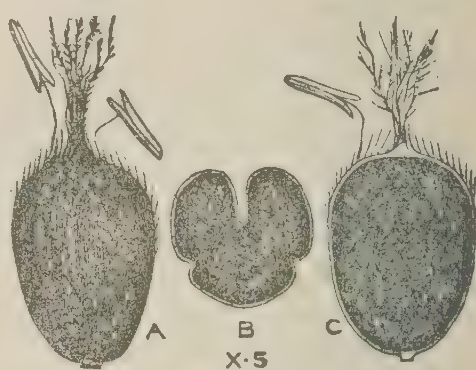

Fig. 10.

"CENTRAL EXPERIMENTAL FARM,
"OTTAWA, 19th March, 1892.

"To the Editor, *Farmer's Advocate*.

"DEAR SIR,—The constant enquiries which come to me from farmers as to the best way to treat grain for Smut make it advisable to draw attention, through your columns, so widely read, to a well-known but effectual remedy. By the time your next issue appears farmers will be preparing to sow their seed-grain. During the past season wheat, barley and oats in many parts of Canada were seriously attacked by the fungous diseases known under the general head of 'Smut.' These diseases are all due to the attacks of parasitic plants, and are propagated by means of the minute grains of black powder of which the Smut consists. These small grains, which are the fructification of the Smut plant, are called spores, and are bodies analogous to the seeds of more highly-organized plants. The diseases are transmitted by means of these spores or 'seeds,' which adhere to the grain and are sown with it. They then begin to grow, penetrate the tissues of the growing plant and in time destroy the seed. The above being the case, and the crop grown in 1891 having been badly infested by these enemies, there is every probability that the crop of 1892 will also be largely destroyed unless means are adopted to prevent it.

"There are several kinds of Smuts, and botanists recognize those which attack the various small grains as different species. For practical purposes, however, they may be considered by farmers as identical, because they all can be overcome by the same remedy. There are many remedies recommended, and for this reason many farmers do not try any. I advise the following, which I believe from all considerations to be the best:

"(1.) Dissolve 1 lb. of Blue-stone (copper sulphate) in 20 gallons of water; soak and stir the grain well in it and leave to soak for 12 hours; then soak in lime water (lime slaked in ten times its weight of water) for 10 minutes.

"(2.) Dissolve Blue-stone (copper sulphate) at the rate of 1 lb. to 2 gallons of water; place this in some large receptacle and pour in grain until it almost reaches to the surface of the liquid; stir well and skim all 'smut-balls' and rubbish from the top. Leave the grain to soak for a quarter of an hour; then pour off the liquid and spread the grain out thinly to dry, and sift dry lime over it.

Should the above be inconvenient, the following may be used:—

"(3.) One pound of Sulphate of Copper is dissolved in a pailful of hot water, which is then sprinkled by one person over 10 bushels of wheat placed in a waggon-box, whilst someone else keeps the grain well stirred. Should a large amount of Smut be detected in grain required for seed, the solution is made stronger, double the quantity of Blue-stone being used." (C. E. F. Bulletin 3, 1888, p. 14.)

"To your own readers I would recommend them to refer to your number for January, 1891, where the subject is treated fully by Prof. Panton. It was also exhaustively treated in Central Experimental Farm Bulletin No. 3, 1888, Bulletin 56, Ontario Department of Agriculture, and Bulletin 32, Manitoba Department of Agriculture.

"There is no question as to the efficacy of the Copper sulphate treatment, and the small percentage of injury to the vitality of the grain is not worth considering when compared with the crop of good, clean grain reaped.

"Wheat, oats and barley may be treated in the same way, but oats should be submerged, not sprinkled only.

"Prof. Kellerman, one of the highest authorities on this continent, says (Bulletin 12, 1890, Kansas Agricultural College, p. 30): 'Since the early part of this century, the almost universal method of preventing Smut has been to soak the seed before planting in a solution of blue vitriol (sulphate of copper). Of the many forms of the treatment in use, perhaps the best is to immerse the seed twelve to fifteen hours in a one-half per cent solution of sulphate of copper (that is 1 lb. in 20 gallons of water), and then put the seed for five or ten minutes in lime water made by slaking lime in ten times its weight of water. This, if properly carried out, will prevent the smut, with but little injury to the crop.'

"Cooke & Berkley, the highest English authorities, say: 'Since dressing the seed-wheat has been so widely adopted in this country, this has been of comparatively little trouble.'

"The above remedies have been tried, and have certainly given good results.

"Messrs. Kellerman & Swingle, who have been investigating this matter of Smuts for several years, and whose conclusions are, therefore, of much weight, have found that, on the whole, and particularly with oats and barley, the 'Jensen hot-water treatment' is the best. This consists of submerging the grain for from five to fifteen minutes in water kept at a temperature of 132½ degrees. I have not yet tried this remedy, so cannot speak of it; but I should judge that there would be difficulties, for farmers without special apparatus, in the way of maintaining the water at the proper temperature. Mr. A. Mackay expresses the opinion that there would be 'no use in recommending this treatment for the North-West Territories; water is scarce and farmers would not take the trouble.'"

GRASSES.

The experiments in grasses have been continued, and the grass plots have attracted a great deal of attention from visiting farmers.

The trial plots of one square rod each have been extended, and a larger number of species have been cultivated than was the case last year. Donations of grass seeds have been received from the following:—

Prof. Macoun, Government Botanist, Ottawa.

Prof. S. M. Tracy, Agricultural College, Mississippi.

Prof. Waldron, Agricultural College, North Dakota.
Mysore Government Botanical Garden, Bangalore, India.
H. L. de Vilmorin, Paris, France.
K. McIver, Roselea Farm, Virden, Man.
A. H. Craven, Duck's Station, B.C.

Herbarium specimens and valuable assistance in the identification of species have been received from Dr. George Vasey, United States Botanist, Washington; Prof. J. Lamson-Scribner, Director Agricultural Experimental Station, Knoxville, Tenn.

Last spring 2,519 packets of grass seeds, made up into 135 collections, were distributed for testing in the different parts of the Dominion. The varieties sent included the best European and native agricultural grasses. Very few reports have been received up to the present; but it is probable that, owing to the fact that it was rather late in the season when the seed was sent out, many of the varieties which did not germinate last season will come up this spring, and others which made some growth will do far better during the coming season.

Some of the statements made in my report for 1890 I find from the results obtained last season require modification or some further notes.

Native Grasses.

Fig. 11.

Fig. 12.

Bromus Pumpellianus, Scrib. (Western Brome Grass), Fig. 11. This is a good grass, very much resembling Austrian Brome Grass (*B. inermis*). On 1st May it was 1 foot high and of good appearance; speared 30th May; flowered 15th June; seed ripe, and 3 feet high, 16th July; much earlier than last year.

Deyeuxia Langsdorffii, Kunth. (Northern Blue-Joint). The second year of the plot. The whole bed divided and filled up 21st May; speared 30th May; flowered 15th June, 27 inches high; aftermath 10 to 15 inches high on 5th September. A fine soft grass, which makes excellent hay.

Deyeuxia Canadensis, Beauv. (Blue-Joint), Fig. 12. This is a fine grass of high quality and free growth. It grows in very wet land, sometimes to a height of 6 feet, and makes excellent hay.

Fig. 13.

Fig. 14.

Fig. 15.

Hierochloa borealis, R. & S. (Holy Grass, Indian Hay), Fig. 13. Mr. Bedford points out, what is undoubtedly quite true, that in land required for farm crops this grass in Manitoba will probably be more trouble to eradicate than will justify farmers in sowing it, except in land that can be left indefinitely in grass.

Muehlenbergia glomerata, Trin. (Wild Timothy). This grass is still a great favourite with all who have grown it. Mr. S. A. Bedford speaks of it in the highest terms of praise. Seed sown in the spring will yield a crop of good hay by August. At Fig. 14 is shown a flowering spike, and at Fig. 15 is a cut showing the whole plant.

Muehlenbergia sylvatica, T. & G. (Bearded Satin Grass). Seed from single plant collected at Ottawa. Sown 28th October, 1890; came up 21st May, 1891; transplanted 6th July; speared 13th August. On 5th September 20 to 24 inches high. This has the appearance of being a valuable grass. It kept green right up to hard frost. The bed is not yet filled, so that no weight could be taken.

Phalaris arundinacea, L. (Reed Canary Grass), Fig. 16. The plot was cut three times in 1890—4th June, 5th August and 16th October. Last season it did not make a good growth; this, however, may have been due to the drought early in the season.

A new bed of the variegated form made a most luxuriant growth; but is not so tall as the type.

Fig. 16.

Fig. 17.

Poa compressa, L. (Canada Blue Grass), Fig. 17. This grass is also known as "Wire Grass." Half of this bed was planted from roots collected wild; the other half from seeds sold wrongly named by one of our seedsmen as *Poa nemoralis*. Both made a vigorous and rich growth. Planted in 1890. A fine succulent growth of young shoots by 30th May; speared 8th June; flowered 24th June; height 18 inches. 7th July height 24 inches, and very even. Half of this bed, cut 5th August, gave 66 lbs. of grass to the square rod. Seed collected from the other half ripe 26th August. The new growth had begun again 5th September. This is rather a small species, somewhat resembling June Grass; but it is easily distinguished by its flat and more numerous stems and their green colour, even when the seed is ripe and has fallen off. It is very hardy, and will thrive in almost any soil, and as it will withstand the effects of drought it is particularly suited for rocky pastures. It flowers about 1st July; the stems remain green a long time, and it makes good hay even when the seeds are ripe; when fed green, our cattle picked it out in preference to all other kinds.

True, June Grass (*Poa pratensis*), which is the same thing exactly as Kentucky Blue Grass, is well shown at Fig. 18. It is not as a rule so highly valued by farmers as it deserves. This, perhaps, may be due to the fact that its chief value is in its leaves, which, although freely produced from early spring till late in the autumn, are not always recognized as belonging to the weak flowering stems recognized by all farmers as June Grass. There are also various forms, some much better agriculturally than others. On the whole, this is the most valuable pasture grass in

the country. All stock relish it. It produces more continuously if kept fed off than any grass I know, and the chemical analysis shows it to be a specially rich food.

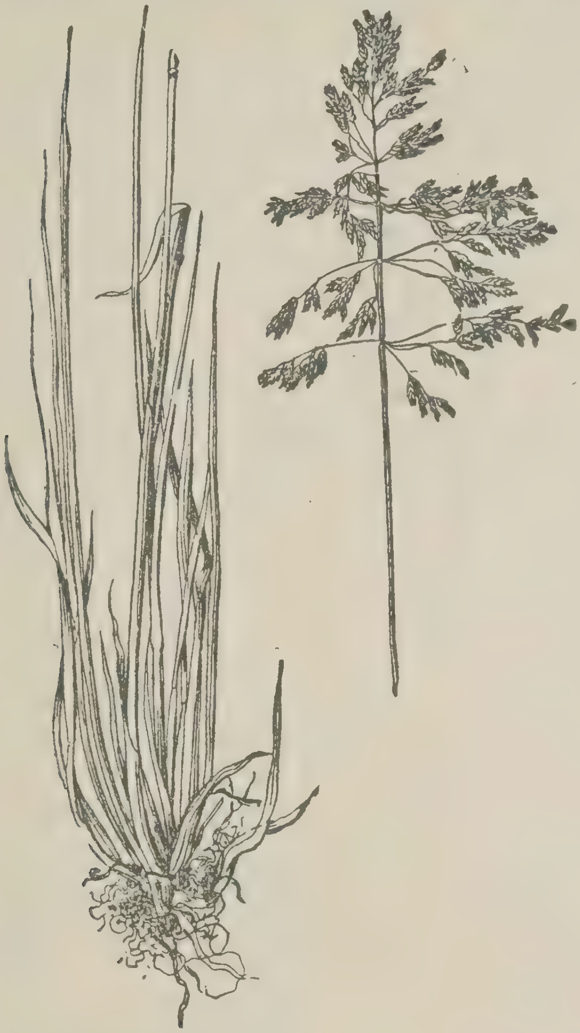

Fig 18.

Fig. 19.

Agrostis vulgaris, With. (Red Top), Fig. 20. It might be supposed that all farmers would know what Red Top is; but this is not the case, and I have had more specimens of this grass sent in for name than any one other kind. Anyone who once knows it will not easily forget it again. The name "Red Top" is also given to many grasses to which it does not belong, as Fowl-Meadow Grass (*Poa serotina*), which is never red; when touched with frost it turns purple. Blue-Joint (*Deyeuxia Canadensis*), a tall water or low-land grass, sometimes 6 feet high, and others. True Red Top is an *Agrostis*, a family in which the florets are single at the end of the slender little stalklets in the panicle. In the Meadow Grasses of the genus *Poa*, the flowers are made up of five or six florets as shown in Fig. 17 and 18. Red Top is a very valuable grass for low land, and produces a heavy crop of rich, soft hay.

Agropyrum divergens, Nees. (Awned Blue-stem). In my last report I say: "Spoken highly of in the west, but made a poor showing at Ottawa." In discussing this grass with Professor Lamson-Scribner, he writes me as follows: "When in Montana I noted this grass particularly, and can assure you that it stood till fall upon the open ranges. The culms were hard and rigid, and cattle would not eat them so long as there was any other vegetation to be had. In the winter season, when stock is starvation hungry, of course it may serve to keep the animals alive."

Agropyrum tenerum (Western Rye Grass). This valuable hay and fodder grass has been specially tried during the past season, at the request of Mr. K. McIver, of Roselea farm, Virden, Man., who kindly sent me a good supply of seed in April last, with the following letter: "Will you kindly sow a small plot of native Rye-grass I send you herewith, and have it tested along with other varieties

you may be growing. I may state that I have been growing it since 1885, and find it does remarkably well here. I had 3 acres of it last season, which I cut with binder, and which yielded about 50 bushels of seed. I intend to sow 15 acres more of it this spring. If it will compare favourably with other varieties in feeding qualities it must be a boon to this country, as stock are very fond of it, both as pasture and hay. This grass has very fine roots, similar to Perennial Rye-grass, only stronger and a little coarser. In fact, it was its likeness to it that made me gather the seed to test it. This is about the only variety that has given me satisfaction here. Timothy is no use, except for one season, and is hard to germinate. Cocksfoot can hardly stand the winter, and what lives is late in starting. The native Rye-grass (as I call it) is very early, affording a nice bite for stock before there is anything green on the prairie."

"January 16, 1892.—I collected this grass in 1885 while putting up hay in the Assiniboine valley. I noticed some tufts a few feet above the water's edge and observed that it resembled our Scotch Perennial Rye-grass very much, except the head. I felt sure that in a few years we should get no wild hay to cut, so concluded to give this grass a fair trial under cultivation. I gathered as much as half filled a flour bag, cutting half down the stem. From this I had enough to sow a plot of ground 400 yards square, which I sowed in the spring of 1886, on a dry sandy soil. It grew over 1 foot long and seeded, but did not fully mature. 1886 was a very dry summer here, so I felt more than satisfied with my success. In 1887 I got it destroyed by a hail storm. In 1888 I had 3 bushels of roughly-dressed seed, which I sowed in 1889 on 3 acres of wheat stubble-ploughed, mixed soil, sand in one part, clay in another, with a large spot of alkali soil. On this plot I had a magnificent crop in 1890, especially on the clay. The plot yielded about 20 bushels of seed to the acre. This last season I had over 4 tons of hay off same plot, which I did not thresh, having no use for seed. This last spring I sowed 45 acres under it, along with wheat, which did so well that I gave some of it to a party collecting for the Toronto Industrial Exhibition, which was fully 4 feet long. In conclusion, I would say that with the few experiments already made in Manitoba I have no fear of its future, as far as hay and pasture are concerned."

The seed sent by Mr. McIver was sown broadcast on 20th May. On account of the dry spring it did not come up until 23rd June. Copious rains fell on the 10th June. By 30th June the grass was 4 inches high. By 10th July 6 to 8 inches, but uneven. It speared 15th August, flowered 20th August, and the seed was ripe 12th September. The following analysis made by Mr. F. T. Shutt would show that this grass has a good nutritive value. Sample taken 8th July, when the seed was in the milk.

Albuminoids	14·06
Fibre	40·15
Ash	5·71
Fat	·98
	60·90
Carbo-hydrates	39·10
	100·00

Foreign Grasses.

The following grasses will not repay cultivation in the Ottawa district:—

Sweet Vernal Grass (*Anthoxanthum odoratum*). Part of a bed was planted in May, 1890, and had become well established by the winter. Two-thirds of this part winter-killed and the remaining one-third recovered very late. Flowered 30th May. This grass is apparently useless for this climate. Such plants as are not winter-killed recover so late that their character for earliness is entirely lost. The other half of the bed was planted out during the summer of 1890, and had made nice vigorous

plants by autumn; but every plant was killed by the winter. This was also the experience we had with this grass in 1887 and 1888.

Wood False-Brome Grass (*Brachypodium sylvaticum*). This variety went into the winter of 1890 with a magnificent appearance. Every plant winter-killed.

Crested Dog's-tail (*Cynosurus cristatus*). The same particulars as the last.

Perennial Rye-grass (*Lolium perenne*). do

Italian Rye-grass (*Lolium Italicum*). do

The following have proved themselves perfectly hardy at Ottawa, and they are probably hardy in all the agricultural districts of the Dominion :—

Tall Fescue (*Festuca elatior*).

The Meadow Fescue (*Festuca pratensis*).

Hard Fescue (*Festuca duriuscula*).

Austrian Brome Grass (*Bromus inermis*). Fig. 21. Of all the grasses not in general cultivation which we have tried, this is by far the most promising. The seed germinates readily and the young plants soon become established. It is conspicuous for its free leafy growth and tall stems which bear an abundance of seed. It flowers here in the last week of June and has produced nearly 4 tons of hay to the acre. It is very hardy, early, and a heavy cropper, and produces a heavy aftermath of succulent leafy shoots, one of which is shown with a panicle of seed at Fig. 20. This grass has also been call "Awnless Brome Grass," "Smooth Brome Grass" and "Hungarian Fodder Plant." The use of the last of these, however, should not be encouraged, as already confusion has arisen on account of the similarity of the name with "Hungarian Grass" a kind of millet.

Fig. 20.

Mr. T. Routledge, writing from Virden, Man., says, 7th September: "I am convinced that this grass is the very best we can get for Manitoba, and the growing of it here is going to be, in my opinion, of very great importance in the future to stock-raisers in this province. What was sown here last spring is now as green as it was a month ago and would still cut for hay, although the prairie grass is dried yellow. I do not think as much of the Western Brome (*Bromus Pumpellianus*, Scrib.), although it is looking very well."

NOTE.—The drought of the spring of 1891 affected very seriously the grasses grown upon the experimental plots, as far as comparative records with other years are concerned—so much so, that any fuller details than I have given above would only confuse and give a wrong impression concerning many of the species.

The figures used in illustration of this section of my report Nos. 11—20 have been very kindly lent by the William Weld Co. (Limited), of London, Ont., and are the same as were used in the number of the *Farmer's Advocate* for March, 1892.

WEEDS OF THE FARM.

There has been considerable enquiry for information concerning weeds of the farm, and farmers generally seem to be alive to the necessity of stamping out a new pest as soon as it appears. There are certain principles which must be borne constantly in mind by those who wish to clear their land of noxious weeds. In the present age of great and easy communication with all parts of the globe, there are frequent opportunities for seeds of weeds being introduced into previously unin-

fested districts. This is, as a rule, with other seeds or in hay and straw used as packing. Perhaps the most fertile source of weeds upon a previously clean farm is bought manure. Notwithstanding all efforts to the contrary, weeds will, however, be constantly introduced from outside sources either with seed, manure, or carried by the elements, and it is well that farmers should understand a simple classification of all weeds by their modes of growth.

Plants may be divided into the following classes: annuals, biennials and perennials. In eradicating weeds it is all-important to know under which of these heads they come.

Annuals—Are those plants which complete their whole growth in a year. As a rule, they have small fibrous roots and produce a large quantity of seed. Examples of this class are found in Wild Mustard, Penny Cress (called in Manitoba Stink-weed or French-weed), Lamb's quarters, Wild Buckwheat, Purslane, Ragweed. There are also some annuals which are biennial in habit, that is, of which seeds ripened in the summer produce a certain growth before winter sets in and then complete their development the following spring. Of these may be mentioned Shepherd's Purse, Penny Cress, mentioned above, and Chess.

Biennials—Are those plants which require two seasons to complete their growth, the first being spent in collecting and storing up a supply of nourishment, which is used the second season in producing flowers and seeds. Examples of these are Burdock, Wild Parsnip, Mullein, Evening Primrose and Viper's Bugloss or Blue-weed.

Perennials—Are those plants which continue growing for several years. Perennial weeds are propagated by various methods. The most troublesome are those which extend long shoots beneath the surface of the ground as Sheep's Sorrel, Canada Thistle, Perennial Sow-thistle, Chicory and Couch Grass. Some perennials extend but slowly from the root by means of short stems or offsets; but produce a large quantity of seed. Of these, Ox-eye Daisy, Dandelion, Golden-rod and Perennial Groundsel are examples.

In adopting a method of extermination the nature of the plant to be eradicated must first of all be taken into consideration. Any method by which the germination of the seed in the soil is hastened and then the young plants are destroyed before they produce fresh seed, will clean land infested by annual weeds. The seeds of some annuals have very great vitality, and will continue appearing for several years as fresh seeds are brought to the surface. Wild Mustard and Wild Oats have been known to germinate after lying deep in the ground for twenty years. Biennials must be either ploughed up or cut off previous to flowering. Where ploughing is impracticable they should be cut off below the crown of the root. For this purpose a large chisel in the end of a long handle (to obviate the necessity of stooping) is as convenient a tool as can be used. Perennials are by far the most troublesome of all weeds and require very thorough treatment, and in some instances the cultivation of special crops, to ensure their eradication. Imperfect treatment, such as a single ploughing, frequently does more harm than good, by breaking up the underground stems and stimulating growth.

There is no weed known which cannot be eradicated by constant attention, if only the nature of its growth be understood. Farmers should be constantly on the alert to prevent new weeds from becoming established on their farms. There are some general rules which all should remember:—1. Weeds do great harm by robbing the soil of the plant-food intended for the crop. 2. They crowd out and take the place of more useful plants. 3. They cause great loss of time to eradicate, and frequently compel the farmer to change the best rotation of his crops, and perhaps grow crops which are not the most advantageous for his farm. 4. *Weeds of all kinds can be eradicated* by constant attention along the following lines : (i.) Never allow them to seed ; (ii.) Cultivate frequently early in the season, so as to destroy seedlings while of weak growth ; (iii.) For perennial weeds, the only means of destroying them is to prevent them from forming leaves and storing up nourishment in their roots. This can be done by constant cultivation. The importance of leaves to plants can be seen by the serious injuries frequently inflicted even upon large forest trees by

the destruction of their leaves by insects. The American larches over thousands of acres in Canada have been destroyed during the last four or five years simply by having most of their leaves eaten by the Imported Larch Saw-fly (*Nematus Erichsonii*). Gooseberry and currant bushes stripped of their leaves during one season by the Currant Worm (*Nematus ribesii*) seldom mature a good crop of fruit the next.

The following are amongst the more important pests of the farmer which have been enquired about during the past season :—

Pepper Grass (*Lepidium intermedium*, Gray.)

Specimens of this plant were sent down by Mr. Bedford from Brandon, where it was not known by farmers, and was causing much alarm from its unusual development and luxuriance. This latter character must, however, have been due to the season, as it is indigenous and very common from the Red River west to the Pacific. It is a slender annual herb, about 12 to 18 inches in height, belonging to the Cress family. It produces an enormous quantity of very small reddish seeds, by far the greater part of the plant consisting of the flowering branches thickly beset with the small, round, flat pods. It grows in the shape of a miniature tree with a central stem and a large spreading head. There are two species of these pepper grasses *L. Virginicum* and the present species *L. intermedium*. They are much alike, but can be at once separated by an examination of the seed. In *L. Virginicum* the seed-leaves of the undeveloped plant, inside the seed, are accumbent—that is, have their edges lying against the radicle, while in *L. intermedium* the seed-leaves are incumbent, or have the radicle lying against the back of one of them.

In July the same weed was sent in by the editor of the *North-West Farmer*, who had received it from Mr. H. Byers, of Portage la Prairie, who had come across it in several places, and in one place "had found about half an acre of a wheat field, where the weed had completely crowded out the wheat." About the same time there appeared in the newspapers several references to the great abundance of the same plant in Minnesota and North and South Dakota, where, owing to unusually wet weather, it had developed more quickly than the wheat crop and crowded it out. In the *Lake County Leader*, published at Madison, South Dakota, 25th June, 1891, the following appears: "Valley city, North Dakota.—Extended observations and well-authenticated reports from all parts of the country show the alarming condition of the wheat on account of the growth of Pepper Grass, the new weed of the Mustard family, which has appeared this year for the first time. Many fields are already entirely ruined, and thousands of acres of wheat that was most promising, being chiefly on summer fallow, will not be worth harvesting. The damage to date is estimated at from 15 to 25 per cent." It is probable that this state of things improved as the season progressed; but the above shows the advisability of farmers making every effort to clean this weed out of their land. It is an annual, and produces no running roots; it is easily seen, and can be easily pulled by hand, which will probably be found the best means of eradicating it.

Penny Cress, "Stink-weed," "French-weed" (*Thlaspi arvense*).

This is considered one of the worst weeds in Manitoba. It belongs to the Cress family, and has great vitality. There are two large successive crops of seed ripened in the summer, and frequently many plants will be found late in the autumn, which pass through the frosts of winter unharmed and ripen their seeds early the next spring. It is an exhaustive weed of a rank, unpleasant odour. It is an annual, and wherever seen should be destroyed. It is very abundant in Manitoba, and is now also found in many other parts of Canada. It can at once be recognized by its small white flowers its large flat pods, frequently over half an inch across, and its pungent odour. Thorough cultivation and hand-pulling will destroy it.

Purslane, "Pusley" (*Portulaca oleracea.*)

The red fleshy leaves and stems of this persistent weed are well known to every gardener. The tiny yellow flowers which appear in July, and are of the same form as those of the lovely garden Portulaca, are followed by pods filled with minute black seeds. This is a very difficult plant to kill, owing to its succulent nature. It must be hoed up very lightly and constantly when it first appears. If hoed heavily some of the plants will be covered by the earth, and will soon take root again.

Common Rag-wort, "Stinking Willie" (*Senecio Jacobæa.*)

I have had considerable and very interesting correspondence with the Rev. Father Burke, of Alberton, Prince Edward Island, concerning this plant, which is a perennial groundsel. It has been introduced from Europe into the Maritime Provinces and has been credited with causing a mysterious disease amongst cattle. It is a perennial, but does not seem to spread much from the root. It matures however, many downy seeds, by which it is becoming rapidly disseminated. The following interesting account of this plant appears in the *Prince Edward Island Agriculturist:*—

"For years aback a dirty, yellow weed of rapid growth and extensive fibrous root has been spreading with wonderful rapidity in the western part of the county. As far as can be ascertained, it was accidentally brought to this country from Ireland by an old settler in a bed tick, who took up land near Tignish. From May, till the frost kills out all vegetation, its rank leaves and ugly yellow head, meet the eye everywhere from the place whence it started as far east as Conway station. Every year it makes a stage of many miles, and at this rate before long will waive its unsightly head from one end of our little province to the other. Up to this time it has been known in the west by the name *Baughlan*, which its importer gave it, and which it no doubt was known by in that part of the Emerald Isle whence it came. But now it turns out to be no less a pest then the European Rag-wort, one of the most troublesome weeds the farmers of the other continent have to deal with." Not knowing its name and alarmed at its rapid spread up west, the Rev. Father Burke enclosed a plant (root, leaves, flowers and seeds), to Mr. Fletcher, of the Central Experimental Farm, and has had the following reply:

"Rev. A. E. Burke, P.P.,
"Alberton, P. E. I.

"My Dear Sir,—I am in receipt of your two favours. The yellow weed concerning which you previously wrote is *Senecio Jacobæa*, the 'Common Rag-wort' of Europe, whence it was imported into the Maritime Provinces. It is a common and troublesome weed in many places throughout Nova Scotia and New Brunswick. Principal Mackay, now of Halifax, says that it is supposed to be injurious to cattle, and I know this was a common belief in England years ago; but as a matter of fact I never saw cattle touch it."

In a late issue of the same paper a correspondent, "Farmer John," writes that this plant is well known in Pictou county, and it is stated that the majority of the farmers there believe that to it and it alone are they indebted for what is known as "the Pictou cattle disease." "An investigation, however, was made by some of the leading veterinaries of America, and they concluded that the weed had nothing to do with the disease, and to prove this, cattle were kept on it for some time."

"Nevertheless, I for one—backed up by the opinion of hundreds of others who are interested—cannot help the conviction that it has to do with causing trouble amongst our cows. One thing sure, where there is none of the weed there is no disease, and after the weed has made itself noticeable in a section the cattle disease follows. So if "Billy" should happen by any chance to be innocent he certainly keeps very bad company, and every effort should be made to stamp him out completely, or it will only be a question of time when it will overrun the whole island.

This is no easy task to do, unless every farmer works to keep it down, for one farm can supply seed enough to seed a whole district.

"Sheep eat it and appear to suffer no ill effect from doing so, and it is claimed hereabouts that sheep are the best motor yet discovered to kill out the weed. I have often wondered why our County Council have not taken the matter up; for, as I have said, the weed will overrun the whole county, as it does any section where it gets a hold, unless prompt measures are taken to stamp it out. But my word for it, its destruction is worth a mighty effort."

Father Burke writes: "I notice nothing will eat it here. I have time and again put it in to pigs, which, closed up in pens, usually rush for anything green; but they would not touch the Baughlan."

It is well that all who see this weed should make an effort to destroy it. In old meadows and pastures digging out each plant will be necessary, as it has such a firm hold on the soil that it is almost impossible to pull it up. Rotation of crops and frequent cultivation will of course destroy it in farm lands; but it flourishes by road sides and in waste places. The only way to eradicate it entirely would be for the members of agricultural societies and farmers' institutes to wage a systematic war against it. This should surely be possible.

Perennial Sow-Thistle. (*Sonchus arvensis*).

This is another troublesome plant which is complained of by farmers every year. Specimens were sent in by the editor of the Stouffville *Tribune*, of Stouffville, Ont., who stated that the plant was beginning to seriously affect crops in that vicinity and that farmers had applied to him for information concerning it and the best method of extermination. It is a perennial, with strong underground stems which spread out a long distance from the centre. The leaves cover the ground closely and choke out the crop amongst which it grows. The flowering stems have no leaves towards the top, where there are three or four large yellow flowers which are conspicuously glandular hairy outside and on the foot-stalks. When this plant is established in a piece of land it can be eradicated only by constant cultivation or hoeing.

Burdock (*Lappa officinalis*).

The large rhubarb-like leaves of this plant, and the burrs with their hooked tips which surround the flowers and seeds, are well known to everyone. The Burdock is a biennial, and is easily eradicated by cutting it off below the collar, or by continuous mowing to prevent the plant going to seed.

Wild Chicory, Succory (*Cichorium Intybus*).

The lovely blue flowers of this perennial plant are very conspicuous along roadsides in many parts of Canada. It also is occasionally found in fence corners and around stone heaps. It has strong spreading root-stocks, but is not a difficult plant to overcome by constant hoeing. The large flat, pure blue flowers are borne on stiff leafless stems and open only early in the morning.

Orange Daisy (*Rudbeckia hirta*).

This is one of our most beautiful wild plants. It has now been introduced into most parts of Canada, where it may frequently be seen in clover fields. The flowers are bright orange with a purple centre, and are about the same size as those of the Ox-eye Daisy. The whole plant is very rough and bristly hairy. During the past summer I received specimens from several places, one of which was from Prince Edward Island, where it was described as "not common, but had attracted attention by its great beauty."

Such a conspicuous plant as this is, catches the eye at once, and it should always be pulled up when seen, as it developes a large number of seeds and spreads rapidly.

Ox-eye Daisy (*Chrysanthemum Leucanthemum*, L.)

Few pests of the farm are better known than this. It is a pernicious weed which has become well established in many parts of the country. This is chiefly in hay-fields and pastures.

To clean these the sod must be turned under and the land put into alternate husbandry. A great deal of good may also be done by digging up all plants found along the sides of farm-roads, etc.

Upon the farm of Mr. S. A. Fisher, of Knowlton, Que., not a plant of this weed can be found, although it occurs all round his farm; and, more than this, a railway passes right through his land. This exemption is entirely due to regularly pulling every plant which shows its flowers. These are not pulled hap-hazard when they happen to be seen, but a systematic search is made for them every year in June.

Canadian Flea-bane (*Erigeron Canadense.*)

This is an annual weed, which may be readily recognized by its numerous very small greenish white flowers. It is a tall, erect, hairy plant, of a particularly weedy appearance. It is easily destroyed by hand-pulling, hoeing and cultivation.

Canada Thistle (*Cnicus arvensis*).

The name "Canada Thistle" has now become so well known that it would be useless to try and get it called by its proper name, Field Thistle. It is not a Canadian plant at all but like most of our worst weeds and injurious insects is an importation from Europe. Grindon in his "Botany" says: "Thistles, more than any other class of farm weeds, indicate habitual neglect, yet they accompany cultivation wherever practised by Englishmen and have now become an annoyance in Australia. Many a good old proverb makes use of them. First we have the timely warning: 'He that sows not corn, plants thistles.'"

The Thistle has a creeping perennial root-stock, which penetrates deep into the soil, and which if broken up will produce buds and roots at each joint. It also produces large quantities of seeds in the perfect flowers. There are two kinds of flowers, some smaller and paler than the others which are perfect and produce an abundance of seed. Some others which are twice the size of these have abortive stigmas and produce no seed.

The Canada Thistle is perhaps the most difficult plant to conquer that the farmer has to contend with; but with determined persistence the worst patch may be killed out entirely. The chief effort should be made by frequent hoeing or cultivation to prevent the plant from forming leaves; in this way the roots soon become exhausted and the plant must die. In heavy land, of course, it is more difficult to destroy both Thistles and Couch Grass; but two hoed crops well cultivated will generally be sufficient.

Couch Grass, "Quack," "Twitch," &c. (*Agropyrum repens*).

This is a perennial grass with a creeping root-stock and possessed of such vitality and vigour of growth that if neglected it very soon takes complete possession of land. The difficulty in eradicating the pest is undoubtedly great, particularly in heavy land; but at the same time it is very much magnified in imagination and I have never met the Canadian farmer yet who could not master it, if he attacked it systematically and observed its nature. Quack grass never sends its root-stocks deep into the soil; therefore in farm land what is called "deep ploughing" rather helps it than otherwise, because it merely breaks up the root-stocks and plants them deeper, and the young shoots soon appear from the bottoms of the furrows, even when the top has been harrowed over and the Quack burnt. In gardens deep digging and trenching bury the weed so deep that it is smothered, and if a few blades do succeed in getting through they are soon hoed off. I have found that

Quack Grass can be destroyed in one season by constant hoeing. This was on light sandy soil. A practice frequently recommended at farmers' institutes is the following, which although I have never tried it would to my mind certainly succeed: Plough lightly about 4 inches deep in autumn, and cross-plough in spring. In June sow with buckwheat and plough this under as green manure as soon as it is in flower; then sow again the same crop and plough it in. Follow the next year with a hoed crop. In the North-West Territories and Manitoba is a western variety of this pest which is called Colorado Blue-stem. (*Agropyrum glaucum* R. & S. var *occidentale* V. & S.) In low land this will doubtless be found troublesome and give the farmer some trouble, but it is also probably the most valuable fodder grass which grows on our western cattle ranches.

Wild Oats (*Avena fatua*).

This is an annual grass and is propagated entirely from seed. The seeds are said to have great vitality, and to lie dormant in the soil for many years if they be buried too deep to germinate. Any method adopted to clean land of this pest must ensure that no seeds are allowed to ripen. Sowing fall rye as a soiling crop, and following with a crop of buckwheat to be ploughed in, and then following the next season with a hoed crop, may be suggested. This plant has been sent to me but very seldom, and it is not found, as far as I know, in this part of Canada. Mr. A. M. Kinnear, of Paris, Ont., wrote to me, however, Sept. 3 : "I am interested in a farm in the township of Dunn, county of Haldimand. The farm has but lately come into my hands, and I find it has been allowed to run into a very dirty condition with various kinds of weeds, one of the fields particularly being infested with a plant known in the locality as "wild oats." In October, specimens of the seed were sent to me, and proved to be, as stated, the Wild Oat (*Avena fatua.*) The seed of this weed may be known by its brown husks, bristly at the base and the long twisted arm. When growing, Wild Oats closely resemble cultivated oats, but the panicle is larger and more spreading. The long awn when dry is much twisted, and when damp it uncoils quickly; for this reason, the name Animated Oats has been given to the seed. Sir William Hooker says: "The use of the Wild Oat, with its brown hairy seed and twisted awn, as an artificial fly is well known; the uncoiling of the awn when wetted causing those contortions by which it imitates a fly in trouble. It is of common use with rustic fishermen."

Chess (*Bromus secalinus.*)

I have many letters and enquiries from farmers with regard to the very remarkable but utterly mistaken idea that wheat can by any possibility change to Chess. This is quite impossible and the strange thing to me is that some of these farmers have not proved it for themselves, by trying to produce Chess experimentally from wheat by some of the causes which it is alleged will do so. A. A. Crozier in his charming little book "Errors about Plants" says on this subject: "No popular error has been more generally held in this country than that wheat will turn to Chess; there are signs, however, that interest in the question is dying out, which probably means that the better educated farmers have ceased to believe in the transmutation theory. None of the leading agricultural periodicals now advocate this theory and some of them decline to discuss it any longer. Nevertheless, the subject is by no means out of date." "The causes assigned for the alleged transmutation of wheat to Chess are numerous and varied: sowing shrunken seed; sowing in a certain time of the moon; injury by Hessian fly; eating off of the plants by stock or by fowls; trampling by animals, or injury by passing vehicles; drowning or freezing out during winter; cutting off the "tap" root in imitation of heaving during winter."

In this country Chess is generally supposed to grow only from fall wheat; but occasionally this faith is shaken by plants being found amongst spring wheat, oats and other crops. Many claim that although Chess seed will grow it will not reproduce itself. Upon informing one of my correspondents that a lady acquaintance had

grown it as an ornamental grass in her garden for many years, he writes me as follows: "I believe that your friend has led you astray. My reasons for saying so are that I have experimented upon the Chess question here, and if Chess seed will grow and produce Chess at Springfield it will not do so here. I sowed good Chess seed at the same time I sowed fall wheat; it grew nicely, looked well in spring; but it never headed out, and it had every possible chance. It is a bastard grain, and as such will never produce seed."

This gentleman, however, is trying again the present season, and at his request I am also trying the same experiment with him; 100 grains each of Chess and fall wheat were sown last September and each grain is marked with a small picket. One quarter is to be trampled on in the spring, and one quarter to be eaten off; part was uncovered and exposed to the frost during the winter and the growth of every plant will be noted, and left standing where grown, to be examined by all visitors to the Farm, where it will convince at any rate those who see it. And even if the information gained has not much value in advancing the agriculture of the country, at least it may prevent the waste of so much valuable time at farmers' institute meetings. where this subject so frequently comes up for discussion. As a botanist, of course, I know there can be only one result from this experiment; every grain of Chess which grows will bear Chess and every grain of wheat will produce wheat. As an experimenter I shall record the result exactly as it turns out, and shall not now anticipate those results, but they will be published in the next report of the Botanist to the Experimental Farms. There is only one remedy for Chess—to sow clean seed-wheat in clean land.

A knowledge of weeds and the best way to eradicate them is patently of great benefit to farmers. I shall at all times be glad to identify specimens of weeds or their seeds if sent to me at Ottawa. Valuable articles on this subject are now appearing in the *Farmer's Advocate* by Prof. Panton, and it will well repay every farmer in Canada to procure a copy of the small work by Profs. Mills and Shaw of Guelph, the "First Principles of Agriculture." The following taken from it I endorse most heartily: "Weeds can be subdued, and if on any farm they are not subdued, the farmer's own apathy or indolence is to blame for it. If weeds that propagate themselves by their seeds (as all annuals and biennials) are prevented from ripening their seed, they must in the end all die out. If those which propagate themselves by their roots are kept from breathing the air by means of their leaves, they also must perish. Hence, if immediately when harvest is over all grain fields be gang ploughed once or twice, much is done towards destroying the weeds of a farm. A reference collection of the seeds of all Canadian weeds has been begun and will, I believe, be of interest to visitors to the Experimental Farm.

REPORT OF THE POULTRY MANAGER.

(A. G. Gilbert.)

To William Saunders, Esq.,
Director Dominion Experimental Farms,
Ottawa.

Sir,—I have the honour of submitting to you the fourth annual report of the operations of the poultry department for the year ending 29th February, 1892. In the beginning of my report of last year a *formula* was given of a warm stimulating morning ration for winter, but varied so as to suit the Asiatic or Spanish families, for the stated reason "that the generous diet suited to the latter breed would tend to make the former too fat to lay well." The result of the treatment was considered satisfactory, so far as egg production was concerned, but it was thought that a ration just as effective, but a little more economical in its constituents, could be prepared. The importance of a cheap winter ration will be evident, for it is at this season when eggs are high in price—because they are scarce—that the margin of profit is greatest. Eggs are more difficult to obtain because the stock are confined to limited quarters, and they are more expensive to obtain because the layers require a more stimulating diet and more careful attention. Notwithstanding all that has been written on the subject of winter laying, correspondents write, visitors ask the questions: "What is the best method of feeding and caring for fowls in winter, so that I can obtain eggs?" From the North-West a correspondent writes: "Eggs are worth 60 cents per dozen here in winter. What kind of fowls are best, and how should I feed them to get eggs in paying quantities?" Again, a visitor says: "I can sell all my eggs at 40 cents per dozen in winter, but just as I am getting them in liberal numbers my fowls begin to lay eggs with soft shells." Another exclaims: "I am very much troubled with my fowls eating their eggs and one another's feathers."

These questions open up the whole subject of the proper winter treatment of laying stock, and they embrace three of the greatest and most discouraging drawbacks to the beginner's success in the shape of eggs laid with soft shells, and egg and feather eating. Answers can best be given by describing the rations fed this winter, and the reasons for so doing, other than that already mentioned.

The Rations of the Present Winter.

The hot morning ration fed during the winter was composed of—

	Lbs.	ozs.
Bran	2	8
Shorts	2	8
Ground meat	1	8

Clover hay—steamed and mixed in liberal quantity.
Salt—very small quantity.
Coarse sand and fine ground oyster shells mixed—about three handsfull.

The whole was mixed with boiling water. Boiled potatoes and turnips were occasionally substituted for the clover hay, for variety in diet is beneficial. The hens did not eat the scalded clover hay when exposed to them by itself, but readily did so when mixed in the soft feed.

The results aimed at in feeding this ration were :—

1. Greater economy by the omission of cornmeal.

2. By supplying lime regularly in soft feed to prevent the laying of eggs with soft shells.

3. By avoiding too generous diet to prevent the hens from becoming so fat as to lay eggs with soft shells.

4. To avoid, by the omission of cayenne pepper or other condiments, a highly stimulating ration, often the cause of eggs being laid with soft shells, or without any shells.

5. To prevent egg-eating, which follows the laying of eggs with soft shells.

6. By the regular feeding of meat and keeping the fowls in active exercise to prevent feather eating, generally caused by the omission of both.

7. To prevent the acquiring of the bad practices named, the cure being very difficult.

8. To furnish the hens, as nearly as possible, with what they can pick up for themselves when running at large outside, such as: insects, in the shape of ground meat; grit (to aid digestion), in the shape of gravel and broken oyster shells; lime, in the shape of ground oyster shells; green stuff, in the shape of clover hay (steamed), cut short and mixed in soft feed, carrots, cabbage, turnips, &c.

At noon, when grain was given, oats were fed in small quantity.

For the afternoon ration wheat was given, with barley (occasionally), mixed in equal quantity. Vegetables, such as carrots, mangels and turnips, were kept always on the floor of the pens. Very little cabbage was fed during the winter.

The rations, as aforementioned, were fed to the following stock in the main building:—

	Pullets.	Hens.
Plymouth Rocks	11	12
Brahmas	—	10
Langshans	—	4
Buff Cochins	—	8
White Leghorns	10	9
Wyandottes	9	4
Andalusians	8	6

Among this stock will be noticed numerous hens, some of them old hens, so-called because they were over two years, and kept for breeders and sitters during the coming season. As there was no alternative, they were placed with the pullets, a practice to be avoided when possible, for the reason given in report of last year, "that the ration which would go to eggs in the pullets would likely make the hens too fat to lay."

The effect in eggs of the rations on the pullets and hens is given as follows:—

——	From 9th December.	January.	February.
11 Plymouth Rock pullets	74	105	50
5 do hens	25	18	15
9 White Leghorn pullets	81	112	124
8 do hens	16	20	18
9 Wyandotte pullets	29	50	99
4 do hens	15	22	15
5 Buff Cochin hens	17	40	22
4 Langshan hens	7	21	5
8 Brahma hens	4	13	11.
9 Houdan hens	....	2	10

It may be said that the showing is not a good one for the number of stock, but it must be borne in mind that the feeding was only experimental. The result, how-

ever, is striking proof of the great value of pullets over old hens as revenue producers, under the same conditions as to housing, care and feeding. The superiority of young stock over old has long been known to experienced poultry keepers, but the fact is appreciated by comparatively few farmers. The conclusions to be arrived at from the experiment are:—

1. That no hens should be kept over two years. Because, after that age they moult so late that the prospective profit is eaten up before they begin to lay.

2. No soft-shelled eggs were laid by the pullets, showing that they are not as likely to do so as the old stock; that the daily mixing of coarse sand, fine gravel and sifted oyster shells in small quantities has a preventive tendency.

3. That no eggs nor feathers having been eaten, to date of writing, the regular supply of ground meat mixed in soft feed is to be recommended.

4. A small quanty of salt was mixed daily in the hot morning ration, but as it created looseness among the Brahmas, Cochins and several Plymouth Rock hens, its use was given up.

5. The feeding of vegetables, viz., carrots, mangels, turnips, &c., &c., in generous quantity, had the effect of keeping the hens in excellent condition, and is necessary for the production of eggs.

6. Scattering the grain food among the straw and chaff always on the floors of pens, kept the fowls (particularly the young ones) active. This grain food should not be fed in too great quantities.

As much Range or Room as possible.

While on the subject of winter laying it may be stated that the layers do better when they can enjoy as much freedom as possible. Many farmers have their poultry houses so situated that with very little trouble or expense they can so arrange as to allow their fowls, access to a barn, stable or enclosed shed, where gravel, sand, coal ashes or other substances may be found for the hens to scratch in. Fowls so situated are not likely to give trouble in the way of eating eggs or feathers or laying eggs with soft shells. But there are others, and perhaps the great majority, who can only allow their laying stock limited quarters from the time of shutting in until the warm spring sun makes bare the earth again. It is to such persons that the results of the experiments enumerated above and the experience gained as to the breeds which stand confinement best will be of most value.

Breeds which have laid best in Winter.

The experience of the past four winters proves that the breeds which are often stated to be the most unsuited to cold climates lay the best. It is often said by the inexperienced, or the prejudiced, that fowls with large combs are not suited for winter layers, because their combs will freeze. If any one wishes to make revenue from his winter eggs he must not keep his layers where their combs will freeze.

There is reason and intelligence to be exercised in the treatment of winter layers as there is in the winter caring of other stock. Of the hens with the large combs, such as Leghorns, Minorcas and Andalusians, no better winter layers or hardier fowls can be had than the White Leghorns. The weight of the eggs laid by this variety will be found elsewhere. The Andalusians and Minorcas are also excellent winter layers, but require to be kept active, as do all the Spanish class. Plymouth Rocks and Wyandottes are well known winter layers. Members of the Asiatic family, viz., Brahmas, Buff Cochins and Langshans require to be hatched out early in the season to make early layers. They require to be skilfully handled during the close confinement of winter to prevent them becoming too fat. A farmer will not make a mistake by choosing his winter layers from the Leghorns, Plymouth Rocks or Wyandottes. The Wyandottes, perhaps, come as nearly filling the bill as possible, having little or no comb, and are good layers. The Houdans did not seem to stand the confinement to winter quarters as well as other breeds. The following classification may serve as a guide in making a choice from the best known breeds:—

Breeds with large combs.—Leghorns, Minorcas, Andalusians, Black Spanish.

Breeds with small combs.—Wyandottes, Brahmas, Cochins, Houdans.

Breeds with medium-size combs.—Plymouth Rocks, Dorkings, Black Javas, Langshans.

Breeds with rose comb.—Leghorns, Hamburghs, Red-caps, White Dorkings, &c.

Breeding Pens made up.

The breeding pens were made up at the following dates:—

Breed.	Number in Pen.	When Mated.
Wyandottes	1 cockerel, 5 hens	March 12.
Plymouth Rocks	1 do 9 do	do 18.
Black Minorcas	1 cock, 6 do	do 19.
Black Hamburgs	1 do 7 do	do 19.
White Leghorns	1 do 15 do	do 21.

The male birds remained with the others breeds not mentioned, all winter.

Eggs set and Chickens Hatched.

When Eggs were Set.	No. of Eggs Set.	Description of Eggs.	No. of Chicks hatched.	When Hatched.	Remarks.
April 13	13	Plymouth Rocks	3	May 4	
do 18	11	Wyandottes	8	do 9	
do 18	13	do	8	do 9	
do 18	13	White Leghorns	11	do 9	
do 18	13	Plymouth Rocks	7	do 9	
do 18	13	White Leghorns	7	do 9	
do 21	13	Plymouth Rocks	6	do 12	
do 24	13	7 Plymouth Rocks, 6 Wyandottes	8	do 15	
do 24	11	Plymouth Rocks	6	do 15	
do 27	13	Houdans	6	do 18	
do 30	13	Andalusians	10	do 20	
May 1	13	do	6	do 21	
do 2	13	6 Langshans, 7 B. Cochins	5	do 22	
do 4	13	7 Brahmas, 6 do	3	do 24	
do 25	13	7 Houdans, 6 Black Minorcas	8	June 15	
do 28	13	6 Andalusians, 7 do	8	do 18	
June 1	13	6 do 7 do	9	do 22	
do 19	13	Mixed	10	July 10	

Two settings of eggs of the following breeds were purchased for the purpose of introducing new strains, viz., White Leghorns, Wyandottes, Plymouth Rocks and Andalusians. The chicks from these eggs with two or three exceptions were strong, vigorous and well marked. The majority of them are now used as breeding stock and with equally well-bred males should give good results.

As in previous years, the sitters were placed in comfortable nests, some on the damp earth of the cellar and others on the dry board floor of the upper compartment of the main building. The report of 1890, page 209, contains full particulars as to the proper management and treatment of sitting hens. Before giving the sitter valuable eggs it is better that she be placed on a nest made of short cut straw, and well dusted with carbolic acid disinfecting powder. Three or four china eggs should be placed in the nest and the sitter allowed to remain on these for two days. The valuable eggs should then be given to her. The probability is that the disinfecting powder has meanwhile driven away vermin that might have been on the hen and she will sit with comparative ease and quiet, which she could not do if annoyed by lice. Many settings of valuable eggs are lost every season from the lack of the necessary attention to the sitter.

Dry Boards *versus* Damp Ground.

The experiment of placing a certain number of eggs on the damp ground and dry boards, with a view of ascertaining hatching results, was continued, with less satisfactory results from the dry boards. The following will show the number of chickens obtained by the different methods:—

When Set.	Number of Eggs Set.	Kind of Sitter.	Number of Chickens Hatched.
		Dry Boards.	
April 21	13	Brahma	6
do 24	13	Black Russian	8
do 29	13	Cochin	6
May 1	13	Plymouth Rock	6
do 2	13	Mixed hen	5
do 4	13	Plymouth Rock	3
			34
		Damp Floor.	
April 18	11	Coloured Dorking	8
do 18	13	Wyandotte	8
do 18	13	Buff Cochin	11
do 18	13	do	7
do 18	13	Plymouth Rock	7
do 30	13	do	10
			51

In the eggs placed on the dry boards there were a number of chickens which had attained to full size but had died, apparently unable to break through the thick integument enclosing the chick inside the shell, and which was unusually dry and tough. In other cases the eggshells seemed to be dried on to the dead chicks so as to make it difficult to separate them, and the best way to do so was to soak both the chick and shell in warm water. It seemed as if it would have had a beneficial effect to have sprinkled the eggs with luke-warm water some times previous to the hatching period. The absence of moisture seemed to have had an injurious effect.

It may be interesting as another experiment to place eggs on the dry boards and sprinkle them occasionally during the hatching period.

Treatment of the Young Chicks.

After hatching, the chickens were allowed to remain in the nest for 18 or 24 hours, so as to become thoroughly "nest ripe." Their first meal consisted of stale bread soaked in milk and squeezed dry. This was continued for nearly a week, with dry bread crumbs for a change. As the chickens grew, a more substantial mixture of shorts, cornmeal and bran was fed, lightly at first and more frequently afterwards. It is most important that the chicks should be fed lightly but often. They should never be allowed to remain hungry for any length of time. A neglected chicken will never make a good market fowl. Full instructions as to the care and management of growing chickens will be found in report for 1890, page 212.

Progress of the Chickens.

The chickens grew rapidly, the Plymouth Rocks and Wyandottes making the most rapid headway, as follows:—

Plymouth Rocks.

Four Plymouth Rock cockerels, hatched on the 12th of May, weighed, on 21st of August following, 3 lbs. 14 ozs., 3 lbs. 8 ozs., 3 lbs. 8 ozs., 3 lbs. 5 ozs., respectively.

On the 7th of October the same birds weighed 6 lbs. 8 ozs., 5 lbs. 14 ozs., 5 lbs. 6 ozs., 5 lbs. 2 ozs.

On the 23rd November, 7 lbs. 4 ozs., 7 lbs. 2 ozs., 6 lbs. 14 ozs., 6 lbs. 12 ozs.

On the 5th December, 7 lbs. 8 ozs., 7 lbs. 4 ozs., 6 lbs. 12 ozs., 6 lbs. 12 ozs.

Wyandottes.

Four Wyandotte cockerels, hatched on the 8th of May, weighed, on the 21st of August following, 3 lbs. 13 ozs., 3 lbs., 2 lbs. 8 ozs., 2 lbs. 8 ozs. It will be noticed that the first mentioned Wyandotte was only one ounce behind the heaviest Plymouth Rock of very nearly the same age. This was a remarkably good result, and goes to show that the Wyandottes make a rapidly-maturing and heavy market fowl.

On the 7th October the same Wyandotte cockerel weighed 6 lbs. 2 ozs., as against 6 lbs. 8 ozs. of the Plymouth Rock, being only 6 ozs. behind.

On the 23rd November the Wyandotte weighed 6 lbs. 14 ozs., as against 7 lbs. 4 ozs. for the Plymouth Rock.

Buff Cochin.

A Buff Cochin cockerel, hatched on the 4th of May, weighed, on the 21st of August following, 4 lbs. 6 ozs.; on the 7th October, 7 lbs. 8 ozs.; on the 23rd November, 7 lbs. 8 ozs. As compared with the Plymouth Rocks and Wyandottes this, at first sight, may seem a good showing, but it must be borne in mind that a great part of the weight of the Buff Cochin was made by his large, bony frame, while the bones of the Plymouth Rocks and Wyandottes were smaller, and their weights were consequently more in flesh—a very important consideration when choosing a breed to produce early market chickens.

When the Pullets Laid.

A White Leghorn pullet, hatched on the 9th of May, was the first of the young stock to lay on the 21st October. A Wyandotte pullet, hatched on the 8th of May, laid her first egg on the 5th December, and she was followed on the 7th of the same month by a Plymouth Rock pullet, hatched on the 12th of May. An Andalusian pullet, hatched on the 21st May, laid on the 10th December, and others of the same breed soon after. The experience of every year goes to prove the advantage of

early chickens. Late chickens are stunted by the cold weather, and never possess the vigour nor attain to the size the others do. The chickens that are put out on the first grass seem to thrive the best.

Shipment of Stock and Eggs.

The demand for eggs for hatching during the spring season was so large that it was impossible to fill all orders. At any time there can only be a limited number of eggs to sell, for there are the branch Experimental Farms to supply and the chickens to raise for our own purposes. On the 9th November the following stock was shipped to the Brandon, Manitoba, Experimental Farm: 1 cockerel, 3 hens, White Leghorns; 1 cockerel, 3 hens, Plymouth Rocks; 1 cock, 3 hens, Wyandottes. Several cockerels of the different breeds were purchased by—and shipped to—farmers in different parts of the country, for the improvement of their stock. As a general rule, the farmers of the country inbreed from one year to another, with a loss of vitality and size to their stock.

Commencement of Winter Laying.

The fowls were put into winter quarters on the 18th November, when the weather became cold, but on the 3rd of December it became warm again and the fowls were let out into their runs, and were able to be out daily until the 17th of the month,when they were shut in for the season. Moulting was got over early by most of the stock, and they went into winter quarters in good health. Winter laying began during the first week in December and continued during the winter. The first breeds to lay were the White Leghorns, Plymouth Rocks, Black Minorcas, Andalusians and Wyandottes.

Diseases of Poultry.

Except in the case of a very valuable fowl, it is not desirable for a farmer, or any one else, to lose time in attempting to doctor a sick fowl. In a case of roup it is better to at once kill the bird and burn its remains, as the disease makes rapid progress, and if once established in a flock is almost impossible to get rid of. Roup is known in its first stages by the fowl sneezing, wheezing or snuffling, sometimes accompanied by a discharge from the nostrils. Later on the discharge becomes thicker and has a very offensive odour. Sometimes the head swells so as to completely close the eyes, the fowl refuses to eat, and eventually dies in a very emaciated condition. There are several forms of roup, all of which are infectious and contagious. Should a fowl be running at the nostrils and escape detection the *virus* is conveyed to the others by the sick one dipping its beak into the drink water and so contaminating it. As showing the beneficial effects of killing off the affected fowls and thoroughly disinfecting the premises, in a case of a very stubborn nature, the following correspondence will be interesting:—

"Saskatoon, 19th September, 1891.

"Dear Sir,—I take the liberty of writing to you to see if you can inform me what is the matter with my fowls and what is likely to cure them. The disease has been amongst them for two years and we have lost from 50 to 100, and they are still going. I have written to the poultry papers and tried all remedies that I have heard of. The first sign of anything wrong is heavy breathing. Then they commence to rattle, as if breathing through phlegm. They show no sign of being sick until their combs begin to turn dark. Then they appear ill, and finally die. For some days before they die they smell very bad. If you could give me the needed information you would confer a very great favour.

"Yours very truly,

"DAVID LUSK.

"Saskatoon, N.W.T."

Mr. Lusk was informed in reply that his fowls had roup, and as it had been among them so long, energetic and immediate action was necessary. He was advised to kill all the ailing ones, and all those appearing the least sick; to burn or bury their remains and thoroughly disinfect the fowl-houses, and then whitewash liberally, with carbolic acid liquid mixed in the whitewash; meanwhile, to keep the remaining fowls away from the infected premises, if at all possible.

On the 5th of November Mr. Lusk wrote that he had found the remedies of the poultry papers a failure; that he was then killing the sick ones off, fumigating the house with sulphur and keeping it as clear as possible. Still, he says, they seem to take it.

In reply he was advised to keep killing the sick ones off as soon as symptoms showed themselves; to continue the disinfecting and thoroughly whitewash. Some pills prepared according to the formula found effective in the treatment of the farm fowls was sent to him, to try as an experiment on any cases that he might take the trouble of isolating and reporting on.

Some time afterwards the following letter was received, and tells of his success in staying the disease:—

"Saskatoon, N.W.T., 11th January, 1892.

"Dear Sir,—I am glad to be able to report that, for some time before and since the arrival of your letter containing the pills, we have not had a case of roup amongst our hens.

"Having lost all faith in all known remedies about the time your second letter arrived, I acted upon the advice given therein, to kill all the affected ones, and appearances now are that the trouble is over. At present the hens look healthy and are beginning to lay.

"Many thanks for advice given and trouble taken by you for my benefit.

"Your obedient servant,

"DAVID LUSK.

"Saskatoon, N.W.T."

ANOTHER INTERESTING CASE.

The publication of the following case, and the treatment for it advised by Prof. Wesley Mills, of the Physiological Laboratory, McGill University, Montreal, may be useful to others:—

"Stromness, 18th January, 1892.

"Manager Poultry Department,
"Experimental Farm, Ottawa.

"Dear Sir,—Having received the yearly report of the experimental farms, I notice that you aid farmers in curing the diseases of their poultry. I am much interested in poultry on the farm as a means of profit. My fowls are troubled with a disease that has caused me serious loss for three years past. The sick fowls get pale around the comb and dumpish. Some linger along for a month or two, and others die in a week or two from the time I notice they are attacked. I aim to get eggs in winter, and feed liberally. I get more eggs than any farmer around, considering the number of hens I keep, but they keep dying off. I kill them and bury them. Those that I have opened have all enlarged livers; in fact, their livers are so large as to fill the hen so full as to displace the other organs. Some have enlarged kidneys as well. One liver I weighed came to three-quarters of a pound. If the fowls were allowed to die all their livers would weigh the same. Some of the livers have whitish spots on them, appear to be very tender, and are much filled with water. My fowls are in too limited quarters, but will soon have more room. Hoping for your advice.

"Yours very truly,

"HENRY E. DICKHOUT.

"Stromness, Ont."

The case was deemed so important that the letter was forwarded to Professor Wesley Mills, asking his opinion and advice in the interests of the farming community. With his usual kindness, Dr. Mills returned the following reply:—

"PHYSIOLOGICAL LABORATORY, MCGILL UNIVERSITY,
"MONTREAL, 13th February, 1892.

"Manager Poultry Department,
"Experimental Farm, Ottawa.

"DEAR SIR,—I have your favour of 11th February, enclosing Mr. Dickhout's letter. From the clear and intelligent account this gentleman gives, I have little doubt that the fowls are suffering from fatty degeneration of the liver, owing to overfeeding and lack of exercise, exaggerated possibly by inadequate ventilation from the 'limited quarters.' Whether there be also cystic disease from parasites or tubercle, it is impossible for me to say without seeing one of the livers.

The remedies are obvious—feeding on oats with vegetable food, scattering with chaff among straw on the floor and enlarging the quarters.

"Truly yours,
"WESLEY MILLS, M.D."

INCUBATOR TRIAL.

On the 13th May 96 eggs were put into an incubator purchased some years ago from A. W. Bessey, of St. Catharines, the manufacturer. The eggs were from the mixed hens which had been running outside for some time and were likely to be fertilized. Careful note was taken of the temperature of the incubator at 7 a.m., 12 noon, 4 p.m. and 8 p.m. The proper temperature to keep was 103. The greatest variations of temperature were on the 17th of May, when the thermometer in the egg chamber rose to 105 for a short time in the morning, and on the 16th May, when 97 was registered in the morning. The desired figure of 103, with these exceptions, was kept with remarkable regularity, but the result was very unsatisfactory. Four chickens only hatched. Examination of the remaining eggs showed five well-developed chicks dead in the shell; 39 ditto imperfectly developed; 17 just started, and 23 eggs with no sign of development, probably not fertilized. It should be stated that the incubator was constructed with two tanks, one on the upper and the other on the lower part of the egg chamber, with the eggs placed on a tray between the tanks. This principle of hatching eggs has received unstinted condemnation. All incubators are now constructed with one upper tank, the eggs being placed underneath and subject to the "top heat." The contention is that the eggs are hatched by the top heat of the hen. The numerous enquiries by letter as to the most improved method of incubation indicate increasing interest in the subject. It is beyond question that artificial incubation is more generally and successfully prosecuted at present than it ever was before in this country, and its advantages can hardly be overestimated.

EGGS KEPT IN DIFFERENT TEMPERATURES AND IN DIFFERENT SUBSTANCES.

The experiments with eggs kept at different temperatures and packed in different substances, in order to ascertain how long they would keep without spoiling, was continued from date of last test, 24th February, 1891, and numbered "Examination 26."

Examination No. 27.—On 14th March, 1891, examined an egg laid first week in August, 1890, and kept in drawer of table in office of main poultry building, placed there the same week it was laid. Contents quite sweet and free from all mustiness.

Examination 28.—On 14th March, 1891, examined an egg laid on the 27th October, 1890, and which had been packed in bran and kept in cellar. Yolk firm and round; quite sweet and free from odour; albumen clear and bright.

Examination 29.—On 14th March, 1891, examined an egg laid on the 29th October, 1890, and which had been kept in the incubator at temperature of 78 to 84 till 11th February, 1891, and afterwards in cellar. Free from odour or mustiness; albumen evaporated until 50 per cent was gone.

Examination 30.—On 14th March, 1891, examined an egg laid on 5th November, 1890, and kept part of the time in incubator at temperature of 78 to 84 and part of the time out. Contents lessened in volume about one-third by evaporation of albumen ; yolk adherent to side and at point of adhesion of musty taste ; otherwise contents perfectly sweet.

Examination 31.—On the 14th March, 1891, examined an unfertilized egg laid on 9th December, 1890, and placed in incubator on 23rd December, 1890, and kept there at temperature of 78 to 84 until 11th February, 1891, and afterwards kept in cellar. Contents quite sweet and free from odour ; albumen a little cloudy ; air space occupied about one-fifth of egg shell.

Examination 32.—On the 14th March, 1891, examined an egg taken from the lot greased with lard and packed in salt on the 10th November, 1890, and kept in cellar. Contents quite sweet ; yolk firm ; has every appearance of a fresh egg.

Examination 33.—On the 14th of June, 1891, examined an egg kept in drawer of table in office from 25th March, 1890. Air space double the natural size ; yolk firm ; white nearly transparent ; contents perfectly sweet.

Examination 34.—On the 14th of June, 1891, examined an egg laid on 27th October, 1890, and put away in bran in a box, with others, in the cellar on the 29th October, 1890 ; yolk firm ; white transparent ; contents perfectly sweet ; has every appearance of a fresh egg.

Examination 35.—On the 4th June, 1891, examined an egg laid on the 3rd November, 1890, greased and packed in salt with others and kept in cellar. Yolk moderately firm ; white almost transparent ; contents quite sweet, and free from all odour or mustiness.

Examination 36.—On the 4th June, 1891, examined an unfertilized egg laid on the 17th December, 1890, and kept in incubator from 23rd December, 1890, to 11th February, 1891, at a temperature of 78 to 84 ; afterwards kept in cellar. Air space occupied one-fourth of space of shell ; yolk firm ; white almost transparent ; contents perfectly sweet and free from all mustiness.

Examination 37.—On the 14th of June, 1891, examined an egg laid on the 30th October, 1890, and kept constantly in incubator at temperature of 78 to 84 until 11th February, 1891, when it was afterwards left in an open basket in cellar. Egg evaporated so as to fill only half of shell ; very little white remaining ; surface of yolk covered with a coating of mould, giving the egg a musty odour ; when the surface with the mould was removed the remainder of the yolk was found quite free from mustiness or any other odour, and quite sweet to the taste. The white, however, had a musty flavour, but not in any sense putrid.

Examination 38.—Examined on the 4th of June, 1891, an egg laid on the 3rd of January, 1891, and was probably in and out of the incubator till 11th of February following. Air space about twice natural size ; yolk firm ; white nearly transparent ; contents perfectly sweet, and free from all mustiness.

On the 18th March, 1892, a final examination was made of the eggs packed away, or kept in the incubator and cellar, as above stated, and it was found that they had, in the great majority of cases, lost their fluid contents and had become musty; but only two or three out of the number could be put down as being positively bad.

Examination also was made of an egg which was laid in August, 1890, and left in the drawer of the table in the office of the poultry building until it was opened on the 18th March, 1892, when the contents were found to be dried up and the yolk quite solid and firm, but quite free from any offensive or musty odour.

Examination was made at the same time of other eggs which had been put in the drawer of the table in the office during the month of April, 1891, and left there since untouched, till date of opening, as given below, with date when laid and result of examination.

No. 1.—An egg laid on the 20th March, 1891, and opened on 18th March, 1892, was found as follows:—Air space fills one-third shell; yolk firm and natural in colour; white nearly transparent; slightly clouded; contents quite sweet, and free from all mustiness or unpleasant odour.

No 2.—Laid 4th March, 1891. Yolk natural in colour; just like No. 1, but yolk partly adherent to shell.

No. 3.—Laid 27th March, 1891. Same as No. 2, but air space fills more than one-third of shell.

No. 4.—Laid 20th March, 1891. Same as No. 3.

No. 5.—Laid 22nd March, 1891. Quite sweet; white entirely evaporated; yolk firm and sticky, but natural in colour, and quite free from mustiness or any offensive odour.

No. 6.—Laid 18th March, 1891. Air space fills about half of egg; white more than half evaporated; nearly transparent, slightly clouded; yolk of natural colour, but much firmer than natural; contents quite sweet, and free from all mustiness.

No. 7.—Laid 18th March, 1891. Contents occupy about one-third of the shell; yolk very firm and sticky; quite sweet, and free from all mustiness.

Nos. 8, 9 and 10.—Same as No. 7, except No. 10, which has a small quantity of albumen, but quite sweet.

WEIGHT OF EGGS.

During the past year much attention has been directed to the size of eggs and the breeds that lay them. It is well known that the breeds which lay the most eggs do not always lay the largest—for instance, take the Black Hamburgs, which lay from 200 to 240 eggs per annum, under favourable conditions, but their eggs are much smaller than those of any other of the standard breeds. On the other hand, the Brahmas, which are credited with laying an egg of large size, only lay 80 to 100 per annum, while there are a number of breeds which lay eggs of medium size and number. Again, different strains of the same breed lay eggs of different size. Pullets do not lay as large eggs as they do when they are hens. Fowls which lay all winter do not lay, as a rule, as large eggs as the hens that have been idle during that time, and only begin to lay when the warm spring weather sets the egg machinery in motion. Eggs laid by hens in confinement are not as large as the eggs laid by the same hens when running at large. It will be said by one person that the White Leghorns lay a small egg as compared with those from the Plymouth Rock and Brahma. Soon after another person will be heard to express surprise at the small eggs laid by their Brahmas or Plymouth Rocks as compared with their neighbour's White Leghorns. Some of the eggs laid by the Farm Buff Cochin hens of the same age are remarkable in their difference of size, one hen laying during last month an egg weighing $2\frac{1}{4}$ ounces, while an egg laid about the same time by her full sister only weighed $1\frac{3}{4}$ ounces. Both hens were kept in the same pen under the same conditions.

In view of the differences noted above, the following table of the weights of eggs of different breeds will be read with interest. It may be stated that the weighing was done on one of the scales in the Chemist's laboratory.

Hens' Eggs.	Lbs.	Ozs.
Plymouth Rocks, single egg	....	2⅜
do per dozen	1	11
Brahmas, single egg. } Weighed in February when hens were confined to house.	....	2⅛
do per dozen.. } Weighed in February when hens were confined to house.	1	9½
do single egg, weighed May; hens out	....	2½
do per dozen do do	1	13
Buff Cochins, single egg	....	{ 1⅔ / 2¼
do per dozen	{ 1 / 1	8 / 10
White Leghorns, single egg	....	2¼
do per dozen	1	10
Wyandottes, single egg	....	....
do per dozen	1	9
Andalusians, single egg	....	2¼
do per dozen	....	....
Black Minorcas, single egg	....	2⅜
do per dozen	1	11
Pullets' Eggs.		
White Leghorns, single egg	....	1 9/16
do per dozen	1	7⅞
Red Caps, single egg	....	2
do per dozen	1	7⅛
Plymouth Rocks, single egg	....	2
do per dozen	1	6⅛
Wyandottes, single egg	....	2
do per dozen	1	7
Houdans, single egg	....	2
do per dozen	1	8
Black Minorcas, single egg	....	2
do per dozen	1	7
Coloured Dorkings, single egg	....	2
do per dozen	....	....

The Poultry Show at the Industrial.

During the second week of the industrial fair held in Toronto in the month of September last a visit was paid to the poultry exhibit, which was up to a high standard of excellence. The same excellent arrangements for accommodation, care and feeding of the stock so conspicuous the previous year were again noticed. At a meeting of the Ontario Poultry Association, held in one of the rooms above the main offices, upon invitation of the president, a short address was made, in which the progress of the work carried on at the Central Experimental Farm was described.

The Wild Geese.

At the beginning of May the wild geese were removed to runs outside, where they had access to tanks of water. They had apparently "paired," and the two pairs were placed in separate runs. Soon after one of the geese laid an egg, which was followed by three others. Two of the eggs were placed under a large Brahma hen, which was broody at the time, and the goose was allowed to sit on the remaining two, but did not sit contentedly, the nest being evidently in too exposed a place, and the eggs did not hatch. One of the eggs under the Brahma hen proved unfertile, while the other, at the end of 28 days, was found to contain a full-sized gosling, but dead in the shell.

Acknowledgment.

In the month of February last the poultry department was presented by Mr. John Gray, the well known Wyandotte breeder of Todmorden, Ont., with a very fine Wyandotte cockerel. The bird is of beautiful shape and markings, and is a valuable addition to the breeding stock.

An Invitation Westward.

In the beginning of the month of January last an invitation was received from the Ontario Agricultural and Experimental Union to read a paper at the annual meeting of the association to be held at Guelph on the 28th and 29th of the same month. Having obtained leave, I was present at the meeting, which was well attended and was most successful, and read a paper entitled "Poultry in its relation to Agriculture," showing the magnitude and value of the poultry interests in this and other countries. Discussion followed, in which surprise was expressed that the farmers did not, as a rule, pay more attention to their poultry as a revenue maker, and manage so as to make their hens lay when eggs were at the highest price.

The Additions to Poultry Building.

The additions to the poultry building are now completed. They are composed of a building 78 by 12, divided into twelve pens, each 8 by 5 feet, with a middle compartment, with chimney for stove if necessary, and containing six feed bins. This building, which runs from east to west and is connected with the main house, contains twelve of the standard varieties to be used as breeding stock. At present the addition contains the following males and females, all of the highest order of excellence:—

Pen 1.—White Leghorns; 7 pullets, 1 cockerel.
2.—Black Minorcas; 5 hens, 1 cock.
3.—Andalusians; 5 pullets, 1 cock.
4.—Plymouth Rocks; 7 pullets, 1 cockerel.
5.—Wyandottes; 5 pullets, 1 cockerel.
6.—Houdans; 5 hens, 1 cock.
7.—Black Hamburgs; 6 hens, 1 cock.
8.—Langshans; 4 hens, 1 cockerel.
9.—Buff Cochins; 5 hens, 1 cock.
10.—Red Caps; 3 pullets, 2 hens, 1 cockerel.
11.—Coloured Dorkings; 4 pullets, 1 hen, 1 cockerel.
12.—Golden Polands; 3 hens, 1 cock.

To this building another is connected, which runs southward. This addition, 96 feet in length by 13 in breadth, is also divided into 12 pens, some of which are 9 x 6, and others 9 x 7. Some of these pens are intended to hold fowls for experimental crossing and the remaining divisions will probably be devoted to geese, ducks and turkeys. There is also a middle compartment, with bins and chimney for stove. Both additions have lofts for holding straw and chaff to let into the pens below. Ventilating shafts run up both sides of the buildings at regular intervals. The inside fittings are of the same style as in the older building. Both additions present a roomy and handsome appearance.

Visitors Increasing in Number.

The visitors to the poultry department continue to increase in number every season. Among the visitors of last fall were several who contemplated going into poultry on a large scale, and who were anxious to get all the information possible as to the best paying breeds, methods of treatment of stock and construction of buildings, incubators, &c., &c. As in previous instances, all the necessary information was cheerfully given, and the methods experience had proved the best shown to them.

Enquiries by letter from farmers are also much more numerous, and indicate an increasing interest in their poultry, a department of their farms which, if properly managed, will not fail to yield a gratifying percentage of profit in return.

A Few Useful Hints.

Farmers will do well to remember the following:—

1. Do not inbreed.
2. Keep no hen over two years.
3. The old hens eat the profit made by the younger.
4. Convert the waste of the farm into eggs and poultry.
5. Too many early chickens cannot be raised. They represent so much ready money.
6. Make hens lay when eggs are highest in price and not when lowest, as is the practice.

In the reports of 1889 and 1890 much information will be found that space will not permit repetition of in this report. These reports may be obtained on application.

I have the honour to be, Sir,

Your obedient servant,

A. G. GILBERT,

Manager Poultry Department.

Central Experimental Farm,
29th February, 1892.

EXPERIMENTAL FARM FOR THE MARITIME PROVINCES.

REPORT OF W. M. BLAIR, SUPERINTENDENT.

To WILLIAM SAUNDERS, Esq.,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith the following report of the operations on the Experimental Farm for the Maritime Provinces at Nappan, N.S., during the year 1891.

WEATHER.

The winter was changeable, with light snowfalls followed in most cases with rain, and changing again to periods of extreme cold.

The spring was dry, with cold winds extending into June; from that time until the end of the year, with the exception of October, the weather was all that could be desired for farm work. The work on the Experimental Farm commenced on 27th April; seeding began on the 30th and continued, with slight interruptions, until 12th June, when the last of the turnips were sown. With fine harvest weather all the crops were secured in good condition.

MANURE.

In addition to the barnyard manure made on the farm, 580 loads of marsh mud were drawn during the winter months. This was supplemented by some special fertilizers of the following kinds:—"Ceres" superphosphate, from Jack and Bell, Halifax, N.S.; the Archibald phosphate, from Samuel Archibald, Truro, N.S., and a few bags of Reliance and Victor fertilizer from the Nichols Chemical Co., of Capelton, Quebec. All of these were found to increase the crops materially.

HAY LANDS.

Both the English and the Broadleaf hay on the marsh was a light crop, while that on the upland was very heavy. About 60 tons of the former and 35 tons of the latter were secured in good condition. It was found necessary to build another brush heap and strengthen those already built, in order to protect the dykes from the heavy swell of high tides, and for this purpose 75 loads of brush and stone were used.

WHEAT.

The following statement shows the quantity of seed used and the names of the different varieties of wheat sown, the size of the plots, height of grain when mature, the condition of straw, when harvested, date of harvesting, weight of grain both in straw and when threshed.

This grain was sown on land where roots and corn were grown last year.

WHEAT.

Seed Sown.	Names.	Date of Sowing.	Size of Plots.	Height of Straw when Mature.	Condition when Cut.	Date of Harvesting.	Weight of Grain and Straw.	Weight of Grain.	Weight per Bushel.	Yield per Acre of Grain in Bush. and Lbs.
Lbs.			Acre.	Inch.			Lbs.	Lbs.	Lbs.	
4½	White Fife	April 29	$\frac{1}{20}$	48	Strong, bright straw	August 26	200	80	52	26·40
4½	Indian Hard Calcutta	do 29	"	34	Stiff straw; some rust	do 20	170	45	56½	15·00
4½	Indian Hard Karachi	do 29	"	36	do do	do 20	110	28	56	9 20
2¼	Colorado	do 29	$\frac{1}{40}$	55	Bright straw; lodged	do 22	255	76½	61	
4¼	White Connell	do 29	$\frac{1}{20}$	45	do some lodged	do 24	310	106	57½	35·20
4¼	Rio Grande	do 29	"	54	Strong, bright straw	do 24	195	58½	58½	19·30
4¼	Defiance	do 29	"	50	do	do 26	260	70	55½	23·20
4¼	Australian	do 29	"	43	Weak straw; lodged	do 26	360	115	57½	38·20
4¼	Gehun	do 29	"	42	Soft straw; some lodged, and rust	do 22	310	103	57	34·20
4¼	Campbell's White Chaff	do 29	"	48	Strong, bright straw	do 25	345	112	56	37·20
4¼	Campbell's Triumph	do 30	"	42	do	do 22	315	104	58½	34·40
4¼	Ladoga	do 30	"	54	do	do 24	275	90	60	30·00
4¼	Red Fern	do 30	"	50	do	do 24	265	104	57	34·40
4¼	Judket	do 30	"	46	do	do 29	215	53	53	17·40
4¼	Russian Hard Tag	do 30	"	45	Soft straw; some rust	do 29	220	59½	59	19·50
4¼	Saxonka	do 30	"	45	Bright straw	do 24	200	75	58	25·00
4¼	White Delhi	do 30	"	36	Short, rusty straw	do 20	175	75	57½	25·00
4¼	White Russian	do 30	"	48	Soft, bright straw	do 25	290	90	57½	30·00
......	Pringle's Champlain	do 30	"	48	do	do 25	360	132	55½	44·00
......	Wellman's Fife	do 30	"	54	do	do 24	265	106	55	35·20

In addition to the above, eleven varieties of winter wheat were sown on the 9th of September. This germinated well and made good growth before the first frost, but the absence of snow thus far during the winter and frequent changes of temperature are unfavourable for this crop.

OATS.

Twenty-five varieties of oats were sown in plots of one-twentieth of an acre each. A statement is given below of the results.

OATS.

Seed Sown.	Names.	Date of Seeding.	Size of Plots.	Height of Straw when Mature.	Condition when Cut.	Date of Harvesting.	Weight of Grain and Straw.	Weight of Grain.	Weight per Bushel.	Yield per Acre of Grain in Bush. and Lbs.
Lbs.			Acre.	Inch.			Lbs.	Lbs.	Lbs.	
4¼	American Triumph	May 4	$\frac{1}{20}$	50	Bright straw; some lodged	August 25	345	132	38	77·22
4¼	Banner	do 4	"	56	do	do 21	368	160	35	94·04
4¼	Black Tartarian	do 4	"	51	Some rust	do 22	335	149	35	87·22
4¼	Bonanza	do 4	"	50	Stiff, bright straw	do 18	375	132½	39½	77·32
4¼	Canadian Triumph	do 4	"	60	do do	do 15	377	146½	42	86·06
4¼	Egyptian	do 4	"	50	Soft do	do 22	365	119¼	39¾	70·05
4¼	Challenge (Webb's)	do 4	"	54	do straw; some rust	do 18	450	155¼	36½	91·11
4¼	Prolific Black Tartarian	do 4	"	54	do bright straw	do 25	420	165¾	34½	97·17
4¼	Early Blossom	do 4	"	50	Some rust	do 22	385	133	38	78·08
4¼	Early Racehorse	do 4	"	42	Bright, strong straw	do 20	358	126	42	74·04
4¼	Flying Scotchman	do 4	"	42	do	do 20	368	162	40½	95·10
4¼	Poland White	do 4	"	52	do	do 17	370	146¼	39	86·01
4¼	Giant Swedish	do 4	"	56	Some rust	do 28	376	156¼	33	91.31
3	Prize Cluster	do 4	$\frac{1}{30}$	51	Strong, bright straw.	do 17	298	118½	38½	104·19
4¼	Rennie's Prize White	do 4	$\frac{1}{20}$	52	do	do 15	327	123¼	40½	72·17
4¼	Victoria Prize	do 4	"	56	do	do 19	398½	150	40	88·08
4¼	White Russian	do 4	"	54	Soft straw; some lodged	do 22	460	161½	38	95·00
4¼	Early English White	do 4	"	42	Bright, strong straw	do 22	310	120	40	70·20
4¼	New Zealand	do 4	"	52	Soft, bright straw; some lodged	do 27	585	207	34½	121·26
4¼	Welcome	do 4	"	41	Bright straw; some lodged	do 22	350	105	35	61·26
4¼	American Beauty	do 4	"	45	Some rust lodged	do 25	465	216	38	127·02
4¼	Early Archangel	do 4	"	57	Soft, bright straw	do 19	415	192½	38½	113·08
4¼	Holstein Prolific	do 4	"	48	Strong do	do 22	370	171	36	100·20
4¼	Rosedale	do 4	"	57	Some rust	do 22	440	209	38	122·32
4¼	Hazlett's Seizure	do 4	"	54	Bright straw; some lodged	do 19	352½	138¼	39½	81·11

These oats were grown on well drained land that had a dressing of marsh mud, drawn during the winter, spread in the spring and worked up with the top soil into a seed-bed before sowing.

BARLEY.

Eighteen varieties of Barley were sown on land that Roots and Corn were grown on last year, on plots of $\frac{1}{20}$ of an acre each, with the following results:—

Weight of Seed.	Names.	When Sown.	Size of Plot.	Height of Straw.	Condition when Grown.	Date of Harvesting.	Weight of Grain and Straw.	Weight of Grain.	Weight per Bushel.	Yield per acre in Bushels and Lbs
Lbs.			Acre.	In.			Lbs.	Lbs.	Lbs.	
4¾	Prize Prolific	May 5	$\frac{1}{20}$	36	Some rust; lodged	Aug. 20	400	120	48	50·00
4¾	Saale	do 5	"	38	do	do 20	300	124	50	51·32
4¾	Golden Melon	do 5	"	39	Soft, bright straw	do 20	324	125	50	52·04
4¾	Danish Chevalier	do 5	"	39	do some rust	do 21	265	106	47	44·08
4¾	Improved Chevalier	do 5	"	38	do do do	do 22	310	107	47	44·28
4¾	Peerless White	do 5	"	42	do do do	do 24	325	114	45½	47·24
4¾	Thanet	do 5	"	41	do do lodged	do 21	250	109	48¼	45·20
4¾	Kinver (Webb's)	do 5	"	42	do do do	do 21	274	116	51½	48·16
4¾	Duck-bill	do 5	"	48	Bright straw; lodged	do 18	451	185	51½	77·04
4¾	Goldthorpe	do 5	"	48	do do	do 25	410	152¾	47	63·31
4¾	Baxter's Six-rowed	do 5	"	42	do	do 12	360	112½	45	46·42
4¾	Rennie's Improved	do 5	"	40	do	do 13	384	138	46	57·24
4¾	Odessa	do 5	"	40	Soft, bright straw; some lodged	do 12	402	146	45	60·40
4¾	Oderbruch	do 5	"	42	do do	do 11	426	171½	49	71·22
4¾	Mensury	do 5	"	48	do straw	do 11	376	157½	45	65·30
4¾	New Golden Grains	do 5	"	40	do do	do 22	165	59	47¾	24·28
4¾	Guaymalaye	do 5	"	36	Some rust	do 22	100	47½	47½	19·38
60	Large Two-rowed Naked	do 5	$\frac{1}{3}$	30	Short, strong straw	do 13	......	658	58½	41·06

Early and Late Seeding.

Below is a statement showing the results obtained from sowing the same kinds of wheat, barley and oats at different periods, one week intervening between each seeding. The size of the plots was one-tenth of an acre.

WHEAT.

—	Quantity of Seed.	Names.	Date of Seeding.	When Harvested.	Weight of Straw and Grain.	Total Weight of Grain.	Weight per Bushel.	Yield per Acre in Bushels and Lbs.
	Lbs				Lbs.	Lbs.	Lbs.	
1st plots... ..	9	Campbell's White Chaff..........	April 30..	Aug. 22..	510	177	59	29·30
	9	White Connell.....	do 30..	do 27..	450	171	57	28·30
2nd plots.....	9	Campbell's White Chaff....	May 7..	do 26..	500	204	58½	34·00
	9	White Connell....	do 7..	do 29..	550	196	56	32·40
3rd plots.....	9	Campbell's White Chaff..........	do 14..	do 29..	560	207½	55½	34·35
	9	White Connell.	do 14..	Sept. 4..	465	171	57	28·30
4th plots.....	9	Campbell's White Chaff..........	do 21..	do 8..	675	196	56	32·40
	9	White Connell..	do 21..	do 9..	586	199½	57	33·15
5th plots.....	9	Campbell's White Chaff	do 29..	do 16..	600	196	56	32·40
	9	White Connell.	do 29..	do 18..	667	191¼	51	31·52
6th plots.....	9	Campbell's White Chaff..........	June 5..	do 18..	575	156	52	26·00
	9	White Connell..................	do 5..	do 19..	576	162½	50	27·05

The Campbell's White Chaff had in all cases bright, strong straw. The Connell lodged somewhat.

BARLEY.

Plots of one-tenth acre each sown.

—	Quantity of Seed.	Names.	Date of Seeding.	When Harvested.	Weight of Straw and Grain.	Total Weight of Grain.	Weight per Bushel.	Condition when Cut.	Yield per Acre in Bushels and Lbs.
	Lb.				Lbs.	Lbs.	Lbs.		
1st plots..	9½	Baxter's Six-rowed..	April 30..	Aug. 14..	450	200	50	Bright straw....	41·32
	9½	Carter's Prize Prolific	do 30..	do 20..	600	220½	49	do . .	45·45
2nd plots.	9½	Baxter's Six-rowed..	May 7..	do 14..	490	206	48½	Some rust	42·41
	9½	Carter's Prize Prolific	do 7..	do 24..	460	242½	48½	Some lodged ...	50·25
3rd plots.	9½	Baxter's Six-rowed..	do 14..	do 18..	445	188	47	Bright straw; some lodged...	39·08
	9½	Carter's Prize Prolific	do 14..	do 28..	530	200	50	do ..	41·32
4th plots.	9½	Baxter's Six-rowed..	do 21..	do 20..	450	185	46¼	Bright straw; some lodged..	38·26
	9½	Carter's Prize Prolific	do 21..	Sept. 2..	410	172½	46	do ..	35·45
5th plots.	9½	Baxter's Six-rowed..	do 29..	Aug. 26..	350	157½	45	Some rust, lodged	32·39
	9½	Carter's Prize Prolific	do 29..	Sept. 8..	346	153	43¾	do ..	31·42
6th plots.	9½	Baxter's Six-rowed..	June 5..	do 10..	320	143	44	Rust and lodged.	29·38
	9½	Carter's Prize Prolific	do 5..	do 11..	357	164	41	do ..	34·08

OATS.

In Plots of one-tenth of an acre each.

—	Quantity of Seed.	Names.	Date of Seeding.	Date of Harvesting.	Weight of Straw and Grain.	Total Weight of Grain.	Weight per Bushel.	Condition when Cut.	Yield per Acre in Bushels and Lbs.
	Lbs				Lbs.	Lbs.	Lbs.		
1st plots...	8½	Prize Cluster.....	April 30..	Aug. 20..	457½	180	40	Bright straw	52·32
	8½	Banner..................	do 30..	do 22..	675	245	35	do ..	72·02
2nd plots..	8½	Prize Cluster...........	May 7..	do 22..	441	154	38½	do ..	45·10
	8½	Banner..............	do 7..	do 26..	655	282½	36½	do ..	83·03
3rd plots..	8½	Prize Cluster......	do 14..	do 26..	450	185	39½	do ..	54·14
	8½	Banner...........	do 14..	do 29..	750	288¾	35	do ..	84·31
4th plots..	8½	Prize Cluster...........	do 21..	do 29..	515	210	40	do ..	61·26
	8½	Banner..................	do 21..	Sept. 3..	425	189	36	do ..	55·20
5th plots..	8½	Prize Cluster...........	do 29..	do 3..	410	168	39½	do ..	49·14
	8½	Banner....	do 29..	do 9..	427	209½	31	do ..	61·21
6th plots..	8½	Prize Cluster...... ...	June 5..	do 9..	381	105	35	do ..	30·30
	8½	Banner..........	do 5..	do 11..	402	159	26½	do ..	46·26

PLOTS FOR TESTING FERTILIZERS.

The testing of fertilizers was continued this year with oats on the same plots on as in 1889 and 1890 of one-tenth of an acre each, an explanation of which is given on page 118 of report of 1889, and on page 235 of report of 1890. A comparative statement of the results for each year is given below :—

—	Fertilizer.	Yield in 1889.	Yield in 1890.	Yield in 1891.	Yield per Acre, 1889, in Bush. and Lbs.	Yield per Acre, 1890, in Bush. and Lbs.	Yield per Acre, 1891, in Bush. and Lbs.
		Lbs.	Lbs.	Lbs.			
Plot No. 1..	Barnyard manure..........................	80	100	96	23·18	29·14	28·08
do 2..	Mussel mud..........................	47	92	153	13·28	27·02	45·00
do 3..	Bone meal....	54½	117	101¾	16·01	34·14	29·31
do 4..	Fine ground phosphates....	44	72	102	12·32	21·06	30·
do 5..	Guano..................	49	76	113½	14·14	22·12	33·13
do 6..	Corn fertilizer....	62	115	111	18·08	33·28	32·22
do 7..	Superphosphate of lime................	70	98	92¼	20·20	28·28	27·07
do 8..	Nitrate of soda..	61	128	90¾	17·32	37·22	26·23
do 9..	Archibald fertilizer.....................	69	93	85½	20·10	27·12	25·05
do 10..	Ceres superphosphate...	68	77	74	20·00	22·22	21·26
do 11..	No fertilizer..	42	79	42½	12·12	23·08	12·17

It must be borne in mind that in 1890 1 brl. of Ceres superphosphate was applied to the whole of the plots of one-tenth of an acre each, in addition to the fertilizer applied in 1889; but no fertilizers were added in 1891.

MIXED GRAINS.

Plots of one acre each were sown with different mixtures of grain, with the results given below:—

1st acre.—With 1 bushel of oats, 1 bushel of barley, 8½ bushels of pease; sown 16th May and harvested 25th August; gave 23 bushels, weighing 48 lbs. per bushel.

2nd acre.—With 2 bushels of barley and ½ bushel of pease; sown 16th May and harvested 25th August; gave 18 bushels, weighing 50½ lbs. per bushel.

3rd acre.—With 2 bushels of oats and ½ bushel of pease; sown 16th May and harvested 25th August; gave 27¾ bushels, weighing 48 lbs. per bushel.

4th acre.—With 1¼ bushels of wheat and ½ bushel of pease; sown 28th April and harvested 7th August; gave 33 bushels per acre, weighing 60 lbs. per bushel.

5th acre.—With a dressing of 100 loads of marsh mud, and sown with 3 bushels of oats on 16th May and harvested 25th August; gave 30 bushels, weighing 39 lbs. per bushel.

6th acre.—With a dressing of 1 brl. of Imperial fertilizer; sown 16th May, with 3 bushels of oats, and harvested 24th August; gave 35 bushels, weighing 41 lbs. per bushel.

POTATOES.

Twenty-eight varieties of potatoes were planted in two rows of 66 feet in length each. The date when planted, character of tubers, and yield, are given below :—

Names.	Date of Planting.	Date of Digging.	Sound Potatoes.	Rotted Potatoes.	Character of Growth.	Total Yield per Acre in Bush. and Lbs.
			Lbs.	Lbs.		
Vanguard	May 25	Sept. 22	65	16	Growth weak; tubers small; early	148·30
Beauty of Hebron	do 25	do 22	100	66	Growth weak; tubers medium; early	304·20
Rose's New Giant	do 25	do 22	115	50	Growth strong; tubers large; late	302·30
Halton Seedling	do 25	do 22	105	20	Growth medium; tubers medium; early	229·10
Brownell's Winner	do 25	do 22	101	27	Growth strong; tubers medium; late	234·40
Clarke's No. 1	do 25	do 22	190	29	Growth strong; tubers large; late	401·30
May Queen Early	do 25	do 22	72	20	Growth weak; tubers small; early	168·40
Early Eating	do 25	do 22	104	50	Growth weak; tubers small; very early	282·20
Chicago Market	do 25	do 22	44	110	Growth strong; tubers large; early	282·20
Early Rose	do 25	do 23	55	50	Growth weak; tubers small; early	192·30
Early Ohio	do 25	do 23	10	87	Growth weak; tubers small; early	177·50
Empire State	do 25	do 23	102	57	Growth strong; tubers large; late	291·30
Algoma	do 25	do 23	25	44	Growth weak; tubers small; early	126·30
Lee's Favorite	do 25	do 23	75	84	Growth weak; tubers small; early	291·30
Thorburn	do 25	do 23	71	105	Growth strong; tubers large; early	322·40
Early Maine	do 25	do 23	42	54	Growth weak; tubers small; early	176
White Star	do 25	do 23	107	69	Growth strong; tubers medium; late	322·40
Rural New Yorker, No. 2, ½ plot	do 25	do 23	160	18	Growth strong; tubers large; late	
Early Puritan	do 25	do 23	61	38	Growth strong; tubers large; early	181·30
Richter's Improved	do 25	do 23	71	30	Growth strong; tubers large; late	185·10
Stray Beauty	do 25	do 23	136	30	Growth strong; tubers medium; early	304·20
Ohio Gunner	do 25	do 23	28	31	Growth weak; tubers small; early	108·10
Rural Blush	do 25	do 23	166	5	Growth strong; tubers small; md. early	313·30
Delaware	do 25	do 23	63	75	Growth strong; tubers med.; md. early	253
London	do 25	do 23	80	40	Growth weak: tubers small; early	220
Wonder of the World	do 25	do 23	90	148	Growth strong; tubers medium; early	436·20
Burbank's Seedling	do 25	do 23	91	120	Growth strong; tubers medium; late	386·50
Great Eastern	do 25	do 24	45	240	Growth strong; tubers medium; late	522·30

CORN.

Thirty-one varieties of corn were planted in two rows, 66 feet long each. The time of planting, stages of growth, time of cutting and weights are given below. The last of May and first of June were cold, and much of the seed planted failed to germinate, and the plots had to be replanted 21 days after the first planting, or on 18th June, thus interfering very much with the results of the experiments.

Names.	Planted.	Tasselled.	Cut.	Weight per Plot.	Condition when Cut.	Weight per acre in tons and lbs.
				Lbs.		
Blunt's Prolific	May 28	Sept. 22	Sept. 25 & 26	335	Early milk	18·850
Golden Dent	do 28	do 24	do 25 & 26	350	Ears just forming	19·500
Chester Co. Mammoth	do 28	do 24	do 25 & 26	375	Ears not formed.	20·1250
Virginia Horse Tooth	do 28	do 25	do 25 & 26	325	do	17·1750
Golden Beauty	do 28	do 25	do 25 & 26	340	do	18·1400
Red Cob Ensilage	do 28	do 23	do 25 & 26	330	Ears forming.	18·300
Mammoth Southern Sweet	do 28	do 4	do 25 & 26	300	Soft glazed	16·1000
Giant Prolific Ensilage	do 28	do 26	do 25 & 26	420	Ears not formed	23·200
Salzer's Fodder	do 28	do 23	do 25 & 26	350	Early milk	19·500
King Philip	do 28	do 24	do 25 & 26	290	do	15·1900
Longfellow	do 28	do 22	do 25 & 26	360	do	19·1600
Long White Flint	do 28	do 21	do 25 & 26	300	do	16·1000
Long Yellow Flint	do 28	do 26	do 25 & 26	355	do	19·1050
Thoroughbred White Flint	do 28	do 30	do 25 & 26	445	do	24·950
Canada Yellow	do 28	do 24	do 25 & 29	340	do	18·1400
Pearce's Prolific	do 28	Aug. 16	do 25 & 26	430	Glazed	23·1300
Mitchell's Early	do 28	do 9	do 25 & 26	200	Hard glazed	11
Red Blazed	do 28	do 15	do 25 & 26	250	Glazed	13·1500
White Flint (Dakota)	do 28	do 14	do 25 & 26	300	do	16·1000
Yellow Flint	do 28	do 14	do 25 & 26	295	do	16·450
North Dakota	do 28	do 14	do 25 & 26	335	do	18·850
Dakota Gold Coin	do 28	do 21	do 25 & 26	270	do	14·1700
Eight-rowed Sugar	do 28	do 26	do 25 & 26	400	do	22
Egyptian	do 28	Sept. 4	do 25 & 26	395	Early milk	21·1450
Extra Early Cory	do 28	Aug. 10	do 25 & 26	155	Hard glazed	8·1050
Pee and Kay	do 28	do 20	do 25 & 26	310	Glazed	17·100
Early Mammoth	do 28	Sept. 4	do 25 & 26	380	Early milk	20·1800
Asylum Sweet	do 28	Aug. 26	do 25 & 26	375	Tasseling	20·1250
Potter's Excelsior.	do 28	do 26	do 25 & 26	305	do	16·1550
Stowell's Evergreen	do 28	Sept. 5	do 25 & 26	350	Early milk	19·500
Cinquantine	do 28	Aug. 20	do 25 & 26	135	Glazed	7·850
N. S. Yellow	do 28	do 10	do 25 & 26	210	Hard glazed	11·1100

This corn, together with 2½ acres of a mixture of different varieties, was converted into about 36 tons of ensilage.

GRASSES.

The following grasses were sown on 8th and 9th May in small plots, and appear, up to the present time, to be hardy and suitable to our climate, but it is uncertain as to what the result of the changeable weather of our climate during the winter months will have upon them :—

Names.

Western Bunch Grass,
Mexican Brome Grass,
Fringed do
Western do
Wild Timothy,
Satin Grass,
Switch Grass,
Reed Canary Grass,
Timothy from Calgary,
Late Meadow Grass,
Austrian Brome Grass,
Southern Brome Grass,
Hard Fescue,
Meadow Fescue,
Tall Fescue,
Orchard Grass,
Perennial Rye Grass,
Italian Rye Grass,
Crested Dog's Tail,
Red Top,
Meadow Fox Tail,

MANGELS.

Fifteen plots of mangels were sown on 26th May, consisting of three rows 66 feet long of each kind. Duplicate plots of the same size and same varieties were also sown on 9th June.

A table is given below of the results.

The first series of plots was sown on the 26th of May and pulled on the 12th and 13th of October. The second series was sown on the 9th of June and pulled 22nd October.

MANGELS.

Name.	1st plot. Sown 26th May, pulled 12th October.			2nd plot. Sown 9th June, pulled 22nd October.		
	Yield in lbs.	Yield per acre in tons and lbs.	Yield per acre in bush. and lbs.	Yield in lbs.	Yield per acre in tons and lbs.	Yield per acre in bush. and lbs.
Mammoth Long Red	510	22·880	748·	630	27·1440	924·
Giant Yellow Globe	440	19·720	645·20	625	27·1000	916·40
Mammoth Long Red (Steele)	575	25·600	843·20	610	26·1680	894·40
New Giant Intermediate (Steele)	650	28·1200	953·20	675	29·1400	990·
Mammoth Long Red (Simmers)	565	24·1720	828·40	620	27·560	909 20
New Giant Yellow Globe (Bruce)	760	33·880	1114·40	510	22·880	748·
Carter's Warden Orange Globe	450	19·1600	660·	560	24·1280	821·20
Gate Post (Bruce)	590	25·1920	865 20	625	27·1000	916·40
Canada Giant (Pearce)	260	11·880	381·20	580	25·1040	850 40
Mammoth Long Red (Webb)	425	18·1400	623 20	405	17·1640	594·
Champion Yellow Globe	310	13·1280	454·40	560	24·1280	821·20
Yellow Fleshed Tankard	290	12·1520	425·20	430	18·1840	630·40
Mammoth Long Red (Evans)	460	20·480	674·40	460	20·480	674·40
Golden Tankard	400	17·1200	586·40	445	19·1160	652·40
Crimson Tankard	475	20·1800	696·40	480	21·240	704·

TURNIPS.

Fourteen varieties of turnips were sown on 26th May, consisting of three rows, $2\frac{1}{2}$ feet apart and 66 feet in length, of each kind. Duplicate plots of the same size and same varieties were also sown on 9th June. A table of the results is given below.

Name.	1st plot. Sown 26th May, pulled 26th October.			2nd plot. Sown 9th June, pulled 26th October.		
	Yield in lbs.	Yield per acre in tons and lbs.	Yield per acre in bush. and lbs.	Yield in lbs.	Yield per acre in tons and lbs.	Yield per acre in bush. and lbs.
Purple-top Swede (Rennie)	575	25·600	843·20	540	23·1520	792·
Carter's Elephant Swede	550	24·400	806·40	515	22·1320	755·20
Skirving's (Steele)	520	22·1760	762·40	555	24·840	814·
Elephant Swede (Steele)	615	27·120	902·	560	24·1280	821·20
Selected Purple-top (Steele)	575	25·600	843·20	535	23·1080	784·40
Bangholm (Simmers)	580	25·1040	850·40	605	26·1240	887·20
Highland Prize (Simmers)	590	25·1920	865·20	535	23·1080	784·40
Marquis of Lorne (Bruce)	590	25·1920	865·20	525	23·200	770·
Hartley's Bronze (Pearce)	550	24·400	806·40	555	24·840	814·
Imperial (Webb)	575	25·600	843·20	595	26·360	872·40
New Giant King (Webb)	605	26·1240	887·20	610	26·1680	894·40
Mammoth Purple-top (Evans)	590	25·1920	865·20	500	20·	666·40
Clyde Improved	595	26·360	872·40	590	25·1920	865·20
Monarch Swede (Pearce)	545	23·1960	799·20	550	24·400	806·40

CARROTS.

Fourteen varieties of carrots were sown on 26th May, consisting of three rows, 18 in. apart and 66 feet in length, of each kind. Duplicate plots of the same size and same varieties were also sown on 9th June. Below is a statement of the results :

Name.	1st plot. Sown 26th May, pulled 19th October.			2nd plot. Sown 26th May, pulled 22nd October.		
	Yield in lbs.	Yield per acre in tons and lbs.	Yield per acre in bush. and lbs.	Yield in lbs.	Yield per acre in tons and lbs.	Yield per acre in bush. and lbs.
Giant Sht. White Vosges (Rennie)	400	29 666	977·46	245	17·1933	598·53
Half Long Scarlet Luc (Rennie)	350	25·1333	855·33	300	22·	733·20
Early Gem	410	30·133	1002·13	280	20·1066	684·26
Mammoth Intermediate White (Rennie)	370	27 266	904·26	310	22·1466	757·46
Improved Short White (Steele)	450	33·	1100·	240	17·1200	586·40
Guerande or Ox Heart (Steele)	310	22·1466	757·46	320	23·933	782·13
Large White Vosges (Simmers)	390	28·1200	953·20	295	21·1266	721·06
Chantenay (Bruce)	345	25·600	843·20	385	28·466	941·06
Large White Vosges (Bruce)	275	20·333	672·13	255	18·1400	623·20
Green-top Orthe (Pearce)	345	25·600	843·20	300	22·	733·20
James Intermediate (Pearce)	280	20·1066	684·26	200	14·1333	488·53
Mitchell's Perfection (Pearce)	180	13·400	440·	220	16·266	537·46
Scarlet Altringham (Webb)	200	14·1333	488·53	205	15·066	501·06
Yellow Intermediate (Webb)	345	25·600	843·20	210	15·800	513·20

GENERAL STATEMENT OF CROPS.

In addition to the hay already referred to, there were in all about 70 acres under crop in 1891. The total yield of grain was 1,158 bushels. Five and a-half acres of roots, chiefly turnips, gave 4,400 bushels, and from three acres of corn 36 tons of ensilage was prepared. There were about four acres devoted to the growing of green crops for summer use for stock, and about as much more in fruits and as plots of grasses.

Eight acres of land were drained this year, making in all over 60 acres of the farm now well drained. All the drains are giving good satisfaction.

BUILDINGS.

Some of the old buildings have been removed this year, which has improved the appearance of the surroundings, and as soon as the necessary buildings for storing carts, waggons and farm implements are built the other old buildings now used for store rooms can be removed.

ROADS.

Road-making has been carried on during the year as time from other work would permit. The roads have all been made with broken stone, and are firm and lasting.

WATER SUPPLY.

Some 900 feet of galvanized iron 1¼-in. water pipe has been laid. But owing to the lateness of the season before the work was commenced, it was found impossible to continue farther. A connection was made at this point with one of the main drains, which so far has given us a supply of good water in the barnyard, and unless we have some very dry, cold weather there will be sufficient for the stock until the dry weather of next spring or summer, when the balance of the pipe can be laid to a permanent supply further back on the Farm.

CATTLE.

The cattle bought last year for fattening purposes were sold in the spring for the St. John, N.B., market.

Experiments are being conducted this year with fattening steers. I may say that with few exceptions the cattle will eat turnips more readily than they will ensilage, and in making the selection the steers that appear to relish the ensilage the best were chosen to feed with that ration. The thoroughbred cattle bought last year have done well; we have several calves from them. When making a selection of cattle this autumn for fattening purposes 7 head of thoroughbred Short Horn females were offered for about the price of good grades, and concluding that it would be a prudent investment the offer was accepted. One of the cows has since dropped a fine bull calf, and they are all doing so well that I would suggest the propriety of keeping them for breeding purposes.

ORNAMENTAL TREES AND SHRUBBERY.

The work of planting trees and shrubbery for the double purpose of ornament and protection from winds was carried on this year; wind-breaks were planted along part of the north and south lines of the farm. A row of American elm was planted on each side of the main road that crosses the Farm, and clumps of trees and shrubbery at different points where needed, which, when grown, will be a source of pleasure as well as a protection to the crops and plants.

FRUIT TREES.

The orchard that was planted in 1890 came through the winter well. The trees have made a fair growth during the past summer. The plums and pears trees have not succeeded as well as the apple trees.

The trunks and larger limbs of the trees were washed in the spring with a solution made of soap and washing soda, which gave the bark a clear, bright green appearance. The Longfield, Wagener, Haas, Scott's Winter and Maiden's Blush had a few apples this year. Preparations are about completed to extend the orchard to 12 acres during the coming spring. For this purpose, in addition to the orchard now already begun, a field of 5 acres has been prepared by chopping down and burning the second growth of timber, care being taken to leave a heavy shelter belt of trees on every side for protection. On this plot a few trees were planted last spring. The land will be levelled as soon as the stumps are sufficiently rotted to be easily taken out. The soil immediately around the trees will be kept cultivated from the first.

SMALL FRUITS.

Strawberries.—These were badly winter-killed by the sudden and frequent changes from rain and mud to extreme cold during the winter. Raspberries and blackberries stand the climate well, and make strong growth and have fruited well. The Houghton, Downing and Smith's Improved gooseberries did well, and as usual fruited heavily. The red and white currants have not so far succeeded well here, while black currants are hardy and heavy croppers.

MEETINGS ATTENÉED.

I attended a meeting of the Nova Scotia Dairymen's Association at New Glasgow on 25th and 26th March, as well as several meetings of farmers in Colchester, Cumberland and Westmoreland counties during the year.

EXHIBITIONS.

Some of the products of the Farm were exhibited at Charlottetown, P.E.I., exhibition, which was held on 6th, 7th, 8th and 9th October.

The exhibits consisted of 127 samples of grains and grasses in straw and 72 samples of grain in glass bottles, and 50 samples of potatoes. The latter were distributed at the close of the exhibition to those present.

Two hundred and eighty packages of grain and potatoes were distributed from here during the year, and some very satisfactory reports have been received from the parties who obtained the seed.

I have the honour to be, Sir,

Your obedient servant,

W. M. BLAIR,

Superintendent.

EXPERIMENTAL FARM FOR MANITOBA.

REPORT OF S. A. BEDFORD, SUPERINTENDENT.

BRANDON, MAN., 31st December, 1891.

To WM. SAUNDERS, Esq.,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith my fourth annual report of the work done on the Manitoba Experimental Farm.

The past year has been a remarkable one from an agricultural standpoint. Spring opened up at about the usual time and by the first week in April seeding was general throughout the province. Through April the weather was unusually warm for that month and vegetation made an early and rapid growth, only to be checked by the severe frost of the middle of May, and in some instances where the grain plant was exposed by the spring winds the injury was severe and made re-sowing necessary. During the last three weeks of June abundant rain fell, and this month was quite favourable for all kinds of vegetation. The temperature during July was much below the average; this helped to fill the heads of wheat, but the number of cloudy, cool days encouraged a rank growth of straw and delayed ripening very much.

On the 6th of August a very heavy rain storm, accompanied by wind, passed over the centre and eastern parts of the province. This storm was of unusual severity, and next morning every acre of crop on this farm was perfectly flat. The effect of the storm was noticeable all through the balance of the season; the sun and wind being unable to penetrate through the lodged and matted grain, ripening was delayed and rust encouraged. The early part of August was warm, but on the 21st the wind veered to the north-west and the temperature dropped very suddenly to one below freezing. As the lowest reading of the thermometers on the experimental farm only recorded one degree of frost, I think no injury was done at that time, but on the 26th of the same month another drop occurred registering two degrees of frost on the uplands and seven degrees in the valley, and at this time all the uncut grain was more or less injured according to its stage of ripeness.

A field of Ladoga growing on the side hill was cut on the 13th of August, thirteen days before severe frost, and was of course uninjured.

A number of varieties of wheat growing on the upland were also cut before the 26th and were also free of injury from frost. Although a number of varieties of wheat grown on this farm have been somewhat injured by frost, you will notice that the yield has in all cases been fair and in many instances very large. The same remark might apply to this province generally, for although the injury by frost has been considerable the yield is much better than usual.

WHEAT.

In view of the importance of the wheat crop in this province and the general anxiety to obtain an early ripening variety, all plots of this grain were duplicated one set of plots being sown in the valley on strong loamy soil and the other set on higher and lighter land.

A number of the varieties sown on the upland were badly injured by wind storms in May; and the returns being inaccurate, are not given. It is worthy of notice that the uninjured plots were saved by a very slight protection of scrub on the south and west; this scrub was only from 6 to 12 feet high, but effectually

protected the grain during the most severe storms, while the grain on the unprotected portion of the field was bared to the roots and severely injured, and in some cases killed outright.

A noticeable feature in these plots is the very slight difference in time between the ripening of the different varieties; as none were injured by frost all ripened fully, and were cut at the same degree of ripeness; the dates given are therefore accurate. All the varieties in these plots were cut before frost and were quite free from rust, smut, &c., and both grain and straw were as nearly perfect as possible, the light character of the soil just suiting the past season.

WHEATS sown on Upland Prairie, summer fallowed; size of plots, one-fifth acre, sown with Press Drill, 6 pecks per acre; soil, light sandy loam.

Variety.	Sown.	Headed.	Ripe.	Maturing.	Yield per Acre.		Weight per Bushel.
				No. days.	Bush.	Lbs.	Lbs.
Red Fife..............	April 8...	July 22...	Aug. 19...	133	52	55	61¼
Old Red River........................	do 8...	do 9...	do 18...	132	47	35	61
Pringle's Champlain........	do 8...	do 6...	do 18...	132	44	55	61½
Campbell's White Chaff...............	do 8...	do 4...	do 17...	131	43	45	60½
Chilian White........................	do 8...	do 3...	do 19...	133	43	..	60
Wellman's Fife...........	do 8...	do 5...	do 20...	134	28	10	60

UPLAND Prairie; plots one-tenth of an acre; very light loam soil.

Variety.	Sown.	Headed.	Ripe.	Maturing.	Yield per Acre.		Weight per Bushel.
				No. days.	Bush.	Lbs.	Lbs.
Red Fife	April 8...	July 5...	Aug. 19...	133	45	5	61½
Green Mountain.......................	do 8...	do 13...	do 20...	134	42	20	61¼
Hungarian Mountain...................	do 8...	do 10...	do 19...	133	42	..	62
Assiniboine..........	do 8...	do 5...	do 19...	133	38	10	60½
Hard Calcutta........................	do 8...	June 30...	do 15...	129	30	20	61

Below will be found a list of wheats grown in the valley on clay loam, a soil not well adapted for a season like the last. It will be noticed by the weight of the grain that all suffered more or less from frost and many of them from rust as well. The heavy storm of 6th August badly lodged some of the varieties; this greatly encouraged rust. Owing to frost the exact date of ripening of some of the varieties could not be obtained and are only given as approximate. In view of the fact that wheat holds such an important place in the products of the country, and that so much attention has been drawn to the importance of securing early-ripening varieties, it has been thought advisable to give full notes of a few of the leading varieties.

Unfrozen Red Fife is no doubt the standard variety in this province, for both quality and productiveness; and if it were only a week or ten days earlier it would be almost impossible to improve on it, but it is certainly later by some days than many other sorts.

White Fife.—This excellent white wheat is being increasingly grown in the province. Its freedom from smut and rust, and the fact of it not readily showing the effect of a slight frost, have all tended to increase its cultivation; it matures with and yields about the same as Red Fife.

White Connell is very much like the White Fife, and may be only an improved strain of that variety. It is generally very productive, with bright strong straw, free of rust, and is not inclined to smut. It is like the White Fife in not readily showing the effects of a slight frost. We have reports from farmers of large yields from seed of this variety supplied by the Experimental Farm.

Red Fern or Eureka is a hard red-bearded wheat, generally maturing from four to six days earlier than Red Fife; being a very dark wheat it shows the effects of even a slight frost very quickly.

Saxonka is a Russian bearded wheat four to seven days earlier than Red Fife, and very vigorous generally, but rusted badly on the low land this year.

Golden Drop is a square-headed, bald wheat, much softer than Red Fife, but three to six days earlier, but scarcely as productive. This wheat was much sought after in this province 15 years age, but is too soft for present markets.

Defiance is a red bald wheat, very similar to the Red Fife, but with us very little earlier.

Ladoga has done remarkably well on this farm, when grown on high well drained land, a seven-acre field of this character the past season yielding 33 bushels of No. 1 wheat, weighing 60 lbs. per bushel, and ripening 13th August, or 13 days before frost, but the valley evidently does not suit it so well, the yield there being small and the grain frozen. On high, well-drained land it is certainly from seven to ten days earlier than Red Fife, but not quite so productive.

Indian Hard Calcutta.—This, like all Indian wheats, is short in the straw and early to ripen. It is not generally very productive and suffered badly by rust during the past season. It is bearded.

Gehun.—Another Indian wheat, but bald, with very short stiff straw. It matures early and was very productive at Indian Head last year, but has rusted both here and at Indian Head this season.

Campbell's White Chaff is a large-headed bald wheat, with about one-third of the grains hard; balance soft; evidently it is hardening here; it is a few days earlier than Red Fife and fairly productive; not thoroughly tested here yet.

WHEAT.

Variety.	Sown.	Harvested	Matured in.	Yield per Acre.		Weight per Bushel.	Character of Straw.	Rust.	Length of Straw.	Length of Head.
			Days.	Bsh.	Lbs.	Lbs.			Inch.	Inch.
Rio Grande.	April 13..	Aug. 31..	140	36	10	55	Weak ..	Blade only..	51	4½
Pringle's Champlain ..	do 13..	do 30..	139	34	40	54½	Fair	do ..	52	3½
White Connell.	do 13..	Sept. 1..	141	34	30	53	do	do ..	50	3
Defiance....	do 13..	do 1..	141	34	10	54¼	Weak ..	do ..	51	3¼
Saxonka......	do 13..	Aug. 24..	133	33	50	54	Lodged.	Badly	46	3
Red Fern or Eureka...	do 13..	do 31.	140	32	30	55	do ..	Slight	50	3½
Judket, ...	do 13..	Sept. 2..	142	32	20	54	do ..	Blade only..	50	3
Russian Hard Tag....	do 13..	Aug. 27..	136	32	10	58½	do ..	do ..	48	3
Red Fife	do 13..	Sept. 2..	142	29	40	47½	do ..	do ..	52	3
White Fife.....	do 13..	do 1..	141	29	10	50	do ..	do ..	51	3
Gehun...............	do 13..	Aug. 22..	131	29	10	57½	Strong..	Very badly.	36	2½
Indian Hard Calcutta.	do 13..	do 25..	134	27	20	54	Lodged.	Badly	47	3
Ladoga...............	do 13..	do 26..	135	22	30	49¾	Fair	Partly	52	3
Colorado.............	do 13..	do 27..	136	20	30	47	Lodged.	Very badly.	48	3
Australian	do 13..	do 26..	135	15	50	47¼	Strong..	do ..	36	2½

NOTE.—Red Fife, White Fife and Ladoga slightly injured by winds.

TEST OF SOME NEW WHEATS

Some of the following varieties of wheat were received late and were sown separate from the above series on back-setting. For a comparison Red Fife was sown in the centre plot

Blue Stem, a variety grown extensively in South Dakota and Minnesota, is a handsome plant with a blueish tinted straw and velvet chaff. It is very productive, but it is no earlier than Red Fife, and the grain is softer. The very light weight of the Delhi and Kent wheat was, no doubt, caused by rust.

Variety.	Sown.	Headed.	Harvested.	Matured in.	Yield per Acre.		Weight per Bushel.	Remarks.
				Days.	Bush.	lbs.	Lbs.	
Blue Stem	April 18	July 17	Sept. 2	137	36	25	52	No rust.
French Imperial	do 18	do 14	Aug. 28	132	32	30	54	Some rust.
Red Fife	do 18	do 17	Sept. 2	137	33	45	54	No rust.
Waugh's Delhi	do 18	do 17	Aug. 24	128	28	00	50¼	Some rust.
Kent Wheat	do 18	do 19	do 25	129	22	20	51½	Rust'd badly

WHEAT—ONE—ACRE PLOTS.

Variety.	Sown.	Harvested	Matured in.	Yield per Acre.		Weight per Bushel.	Character of Straw.	Rust.	Length of Straw.	Length of Head.
			Days.	Bush.	lbs.	Lbs.			Inch.	Inch.
Old Red River	April 10	Aug. 31	143	35	45	55½	Fair	Slight	48	3
Red Fife	do 10	Sept. 1	144	35	30	52	do	do	50	3
Ladoga	do 10	Aug. 25	137	25	45	53½	do	do	53	2½
Golden Drop	do 10	do 29	141	21	35	50	do	Straw rusted	48	3¾
Australian	do 10	do 29	141	14	31	46	Weak	Very badly.	49	3¼

TEST OF CUTTING WHEAT AT DIFFERENT STAGES OF RIPENESS.

During the past four or five years the practice of cutting wheat more or less green has grown rapidly in this country, until at the present time there is scarcely a farmer who does not practice it to a greater or less extent. When cut at a too early stage the berry is much shrivelled and the yield reduced. To determine the extent of this reduction the following experiments were undertaken :—

Three adjoining plots were sown at the same time with Red Fife and cut at three different dates; the first two cuttings escaped the frost, but the grain was much shrivelled, especially from the first cutting. It will be seen by the following tables that in spite of the shrivelled appearance of the sample cut on the 24th of August it brought the highest price per bushel and yielded the most money per acre. It is almost unnecessary to explain that if the sample cut in September had escaped the frost the result would have been quite different; it would then have brought 75 cents per bushel, or $23.50 per acre.

Variety.	Cut.	Colour of Straw when Cut.	Stage when Cut.	Yield per Acre.		Weight per bsh.	Value per bsh.	Value per Acre.	
				Bush.	lbs.	Lbs.	Cts.	$	cts.
Red Fife	Aug. 19	Very green	In early milk	21	20	50½	42	8	96
do	do 24	Green	In late milk	28	00	54½	54	15	12
do	Sept. 6	Ripe	Cured, but frosted.	31	20	53½	35	10	96

TEST OF "DISC HARROW" CULTIVATION AGAINST "SPRING PLOUGHING."

During 1890 the different forms of disc harrows were largely used in preparing the seed bed for the different varieties of grain, also in some cases for covering the seed.

The reports concerning the success of this plan were very conflicting, some claiming that the shallow cultivation with the disc harrow hastened maturity; the work was done at a greatly reduced cost, and was equally efficacious in keeping the weeds in check, and the yield nearly if not quite as heavy as on ploughed land.

Others contend that disc harrow cultivation had nothing to recommend it in the way of hastening maturity, and that it greatly encouraged weeds, particularly couch grass.

To test the question on this farm four half-acre plots were selected in the higher portion of the valley; soil a rich sandy loam. The field was summer-fallowed in 1889 and sown to wheat in 1890. The plots were uniform and the test satisfactory.

On the 17th of last April each plot was sown with Red Fife at the rate of seven pecks per acre.

It will be seen by the following table that the spring ploughing not only gave the best returns, but matured earlier and was freer from weeds. The sample of wheat was equally good, being No. 2 hard from all the plots.

It was also noticeable that the disc-harrowed plots had a large number of short-strawed plants with poor heads, while the plants in the spring-ploughed plots were all equally vigorous and the heads all well developed.

Method of Cultivation.	Harvested.	Yield.	
		Bush.	Lbs.
Plot No. 1.—*Ploughed in spring*, harrowed with flat harrow and drilled; no weeds.	Aug. 25..	44	34
do 2.—Stubble burnt off; wheat *drilled in* and harrowed with flat harrows; some weeds	do 26....	40	00
do 3.—Stubble *burnt off*; wheat "Cuttaway Disc" harrowed in; quite weedy	do 27....	39	12
do 4.—Stubble *not burnt off*; wheat "Cuttaway Disc" harrowed in; quite weedy	do 27....	31	08

ONE OR TWO PLOUGHINGS FOR FALLOW.

A great difference of opinion exists regarding the proper treatment of summer fallow for wheats. To test this matter three adjoining plots, each one acre in area, were selected.

Plot No. 1 was ploughed once on 26th June, and the weeds kept down the balance of the season by means of the common and disc harrows.

Plot No. 2 was ploughed once on 26th July, and the after cultivation was the same as No. 1.

Plot No. 3 received one ploughing on 26th June and another on 1st August, and one harrowing afterwards.

Appended will be found the returns from each plot:

Variety.	How treated.	Sown.	Harvested	Yield per Acre.	
				Bush.	Lbs.
Red Fife..........	Ploughed once, 26th June..................	April 16..	Aug. 30..	30	41
do	Ploughed once, 26th July..................	do ..	do ..	25	46
do	Ploughed on 26th June and 1st August.....	do ..	do ..	27	57

SMUT.

Both farmers and grain-buyers report that smut is largely on the increase throughout the province, and that the direct loss to the farmer this year will reach thousands of dollars, besides the indirect loss arising from injury to the reputation of our wheats on the English markets.

In 1890 a number of experiments with bluestone and other preparations for killing smut were made and carried out successfully. Last spring these experiments were repeated, but owing to a wind storm in May the test was spoilt. This was disappointing, as additional experience on this subject would be valuable just now.

The question being a very important one, it was thought advisable to insert in this report a description of last years experiments as given in the 1890 report.

Four adjoining plots were set apart for this purpose. Plot No. 1 was sown with wheat not treated. Plot No. 2 was sown with wheat treated with bluestone—1 lb. of bluestone being dissolved in a pail of hot water, and applied to ten bushels of wheat, which was then left to soak for three hours. Plot No. 3 was treated with a salt brine sufficiently strong to float an egg, the seed being soaked in the brine three hours and then dried. Plot No. 4 was treated by the Jensen or hot-water method; the seed, placed in a gunny sack, was immersed in water heated to a temperature of 130 degrees, Fah., then removed to another boiler of water heated to 132 deg. and soaked in the latter for 15 minutes.

All were in adjoining plots and received similar treatment during growth and harvesting; when ripe 200 heads were taken from each plot and examined. Plot No. 1, or untreated, gave 6 per cent of smutty heads. Plot No. 4, or scalded, gave 1 per cent of smutty heads, while none of the 200 heads from the plots Nos. 2 and 3, (the bluestoned and salted) were smutty.

After threshing, the grain was again examined, and the bluestoned gave two smut balls to the thousand grains of wheat, the salted gave three and the scalded five, while the untreated gave 29.

These results would point to the conclusion that none of these methods can be depended upon to completely destroy the spores in badly smutted seed, but the bluestone treatment was one of the most successful; its application requires the least labour and leaves the seed in the best condition for sowing. Below will be found the yield and other particulars of this experiment.

Variety.	Sown.	Came up.	Headed.	Ripened	Yield per Acre.		Smutty Head.	Smut Balls in Grain.	Matured in.
					Bush.	Lbs.			Days.
Red Fife, Untreated.........	April 23	May 9..	July 10.	Aug. 22.	23	18	6½ per c.	29 per 1,000	121
do Bluestoned...	do 23	do 9..	do 10.	do 22.	25	11	None.	2 do	121
do Salted	do 23	do 9..	do 11.	do 22.	22	9	do	3 do	121
do Scalded........ ..	do 23	do 9..	do 9.	do 22.	23	44	1 per c.	5 do	121

EXPERIMENTS WITH OATS.

The past season has been an exceptionally good one for oats, the yield throughout the province being much heavier than usual, but the weight per bushel is every where under the average; this is no doubt owing to the excessive and soft growth made during June and July. There was also much rust on oats grown on strong land, no doubt from the same cause, coupled with cloudy weather in July.

English White Oats have again given the largest yields, but they are this year much lighter in weight than usual.

Prize Cluster had the brightest straw and Early Race Horse gave the best sample of grain.

Among the earliest to ripen this season were Welcome, Early Race Horse, Winter Grey, Prize Cluster and Archangel.

Excellent reports have been received from farmers supplied with Black Tartarian seed, but this variety has not succeeded as well as usual on this farm.

TEST OF VARIETIES OF OATS.

Grown on summer fallow; soil, rich black loam; sown with 9 pecks seed, Press drill. Size of plots, one acre.

Variety.	Sown.	Headed.	Harvested.	Matured in	Yield, 1891, per Acre.		Lbs. per Bush.	Yield, 1890.		Quality of Straw.	Rust.
					Bush.	Lbs.	Lbs.	Bush.	Lbs.		
English White....	May 8..	July 28.	Aug. 29.	113 days	83	05	34½	83	12	Fair ...	Slight.
Banner...........	do 8.	do 29.	Sept. 3.	118 do	81	33	....	73	18	do ...	do
Early Race Horse.	do 6..	do 22.	Aug. 22.	108 do	77	08	40½	51	00	do ...	do
White Russian....	do 6..	do 29.	Sept. 1.	118 do	74	14	36	73	04	Weak ..	Considerable.
Early Blossom...	do 6..	do 30.	do 4.	121 do	74	09	34	82	32	do ..	do
Early Archangel...	do 7..	do 21.	Aug. 25.	110 do	72	29	40	60	24	Fair ...	Slight.
Welcome..........	do 6..	do 23.	do 22.	108 do	72	27	40	72	00	do ...	do
Holstein Prolific ..	do 7..	do 28.	Sept. 5.	121 do	70	26	34	72	24	Strong..	do
Black Champion ..	do 6..	do 30.	do 5.	122 do	69	09	37	74	04	Weak ..	Considerable.
Giant Swedish....	do 7..	do 31.	do 9.	125 do	68	30	31	56	24	Strong..	do
Glenrothern	do 6..	do 31.	do 5.	122 do	67	25	....	77	04	do ..	Slight.
Black Tartarian...	do 6..	do 29.	do 5.	122 do	66	28	35½	78	22	Fair ...	do
Winter Grey.....	do 6..	do 21.	Aug. 22.	108 do	66	26	39	69	25	do ...	do
Prize Cluster......	do 8..	do 27.	do 26.	110 do	66	08	39	54	14	Weak ..	None.
American Triumph	do 7..	do 31.	Sept. 7.	123 do	64	02	....	69	10	Strong..	Slight.
Australian........	do 8..	do 29.	do 4.	119 do	59	26	....	72	02	Weak ..	Considerable.

EXPERIMENTS WITH BARLEY.

Two series of plots were sown with barley, one on light loam and the other on heavier land. The varieties sown on light loam were injured so badly by wind in May that the returns would be misleading and are not given.

The following varieties were sown on half and three-quarter acre plots on back-setting; soil, strong clay loam; nearly all were more or less lodged and the colour and plumpness of the samples somewhat injured.

California Prolific well deserves its name and is a very promising variety; the head is very similiar to the two-rowed Duckbill, and like it has good stiff straw.

Webb's Kinver Chevalier is a very promising variety from England, where it has taken the lead as a malting barley for some years; it had the stiffest straw of any of the Chevalier sorts sown.

Odessa Six-rowed is again much more prolific than the Rennie's Six-rowed.

All were sown with the Press drill, at the rate of 7 pecks per acre.

VARIETIES OF BARLEY.

Sown on clay loam soil, backsetting, with Press drill, 7 pecks per acre; size of plots, $\frac{1}{2}$ and $\frac{3}{4}$ acre.

Variety.	Sown.	Headed.	Harvested	Yield per Acre.		Weight per Bushel.
				Bush.	Lbs.	Lbs.
Prize Prolific	April 23..	July 15..	Aug. 19..	75	34	50½
Two-rowed Duckbill	do ..	do 8..	do 14..	75	10	52½
California Prolific	do ..	do 9..	do 14..	68	47	50½
Danish Chevalier	do ..	do 15..	do 19..	68	16	52
Odessa Six-rowed	do ..	do 2..	do 12..	66	14	53
Webb's Chevalier	do ..	do 8..	do 18..	61	17	52½
Goldthorpe	do ..	do 16..	do 18..	65	21	50
Beardless	do ..	do 16..	do 18..	58	34	50½
Rennie's Six-rowed	do ..	do 6..	do 12..	56	39	48
Two-rowed Naked	do ..	do 5..	do 16..	50	18	60

FALL AND SPRING PLOUGHING.

A test of the comparative merits of fall and spring ploughing for wheat and oats was made on the higher portions of the farm. The plots were one-half acre each; soil, a light gravelly loam. The previous crop was wheat on back-setting.

It will be seen from the following tables that fall ploughing has given the best results with both wheat and oats. This is an unexpected result and should not be acted upon until the experiment has been repeated a number of times. It is quite evident that the time of ploughing for, and the manner of sowing oats, largely affect the date of ripening. This was noticeable all through the experiment. Good results have been obtained during the past season by sowing oats a few hours after ploughing, before the soil has time to become dry. Further experiments on this line are needed, for it is thought that much loss is sustained in the drying out of the seed bed by the ordinary method, and the ploughing in of the seed apparently delays ripening.

Fall and spring ploughing. Soil, light gravelly loam; size of plots, one-half acre each.

Variety.	Sown.	Harvested.	Yield per Acre.	
WHEAT.			Bush.	Lbs.
Red Fife, ploughed in spring and sown with Press drill..	April 18........	August 20......	20	08
do in fall do ..	do 18........	do 20......	27	28
OATS.				
Black Tartarian, ploughed in spring, sown with Press drill	April 20........	August 22......	55	22
do ploughed in fall do ..	do 20	do 16......	59	07
do sown broadcast and ploughed in........	do 20........	do 30	48	13

TEST OF DRILLS.

Arrangements were made to continue the test of drills begun two years ago, and nine plots were set apart for this purpose, but the late spring frost severely injured the oats, and the returns from that grain being inaccurate, are not given.

Below will be found particulars of this year's experiment; also the returns of a similar test for 1890. It will be noticed that this year's results confirm those of last year, and it is quite evident that on land similar to that of this farm drill sowing has a decided advantage over broadcasting.

TEST of Drills with Wheat and Barley on summer fallow ; soil, clay loam.

WHEAT.

Method of Sowing.	Sown.	Sown per Acre.	Headed.	Harvested	Yield per Acre, 1891.		Yield per Acre, 1890.	
					Bush.	lbs.	Bush.	lbs.
Common drill......................	April 15..	7 pecks...	July 24...	Sept. 2...	33	20	30	24
Press drill.........................	do 15..	6 do ...	do 24...	do 2...	28	50	29	31
Broadcast machine..............	do 15..	8 do ...	do 29...	do 5...	22	10	28	20

BARLEY.

Press drill..........................	April 24..	6 pecks...	July 16...	Aug. 19..	55	10	60	14
Common drill........................	do 24..	7 do ...	do 16...	do 19..	50	30	56	10
Broadcast machine...............	do 24..	8 do ...	do 18...	do 19..	42	14	50	46

Test of Thick and Thin Seeding.

The experiment undertaken in 1890 to determine the proper quantity of seed to be used with the different kinds of grain was repeated during the past season, with very similar results. Seven pecks of wheat again gave the largest yield, while the results with oats and barley vary little from last year's test. All the plots were sown with the common drill; soil, rich sandy loam.

WHEAT.

—	Sown.	Headed.	Harvested.	Yield per Acre.	
				Bush.	lbs.
Red Fife, 4 pecks per acre..........................	April 16....	July 20.....	Sept. 1.....	33	20
do 5 do	do 16....	do 20.....	do 1.....	36	25
do 6 do	do 16....	do 20.....	do 1.....	38	55
do 7 do	do 16 ...	do 20.....	do 1.....	39	55
do 8 do	do 16....	do 20.....	do 1.....	39	05

OATS.

Welcome, 8 pecks per acre..........................	April 16....	July 14.....	Aug. 18....	86	01
do 9 do	do 16....	do 14.....	do 18....	87	12
do 10 do	do 16....	do 14.....	do 16....	87	02
do 11 do	do 16....	do 14.....	do 16....	78	13
do 12 do	do 16.. .	do 14. ...	do 16....	88	23

BARLEY.

Two-rowed Duckbill, 5 pecks per acre..............	April 24....	July 16....	Aug. 16....	53	01
do 6 do	do 24....	do 16....	do 16....	57	14
do 7 do	do 24....	do 16....	do 16....	59	33
do 8 do	do 24....	do 16....	do 16....	58	31
do 9 do	do 24....	do 16....	do 16...	51	67

EXPERIMENTS WITH SMUDGES.

Smudges were largely used during the past fall for the prevention of injury by frost, farmers in some districts forming organizations for this purpose, and in others depending on individual effort.

Although realizing the difficulty of obtaining reliable results from experiments in this line, it was thought advisable to obtain all the information possible.

Two nights were spent during the second week in August testing thermometers in and out of smoke, but owing to the wind being too strong no conclusion could be reached. All the nights of the 20th and 21st August were also spent by me in attending smudges, which were started at sundown, and testing thermometers; and it was thought that there was at least a difference of two degrees between the thermometers in and out of the smoke. It is, however, very difficult to test this matter fully. A difference of a few feet in the level of the ground where the two thermometers are placed, a difference in the current of air passing over either of the instruments (caused by a ravine, cultivated land, &c.), changes in the wind, &c., are all disturbing elements which must be taken into consideration in reaching accurate conclusions.

It would appear, however, that a small smudge started only a short time before frost has very little effect in checking it.

The beneficial effect of even a small amount of cloud was noticed on the night of the 21st. From 6 p.m. of that night to 1 a.m. on the 22nd the sky was perfectly clear and the thermometer fell from 2 to 4 degrees every hour; from that time to 4 o'clock a few clouds appeared and the thermometer remained stationary. At 4 the clouds cleared off and the temperature immediately fell 4 degrees. It would appear from this that a dense smoke kept suspended over the crop from sundown to sunrise should have an effect somewhat similar to clouds, and prevent the temperature from falling.

MIXED GRAIN GROWN FOR HAY AND GREEN FODDER.

Much interest having been shown in the experiments undertaken here during 1890 with mixed grain for fodder, the most promising of these mixtures were again tested during the past season, and with gratifying success, the yield in every case being even larger than in 1890.

The grain was sown on backsetting with a common drill on the 26th April, the oats or barley being first sown, and the pease were afterwards sown between the drills of the first sown grain; this plan gave the roots of each variety of grain room to spread, but when both kinds of grain are sown at the same time the oats or barley generally crowds out the pease, greatly reducing the yield.

Spring rye was also sown at the same time on an adjoining plot, but the yield of fodder from this grain was much lighter than from any of the others.

MIXED GRAIN grown for Hay or Green Fodder.

Varieties.	Pecks per Acre Sown.	Stage when Cut.	Height.		Weight, Green.		Weight, Dry.	
			Ft.	in.	Tons.	lbs.	Tons.	lbs.
Oats........Black Tartarian .... Pease...... Prince Albert	8 pecks... 4 do ...	In early milk.... Podded	5 6	0 0	13	275	4	1,675
Oats........Black Tartarian .... Tares.......Large English............	8 do ... 4 do ...	In early milk.... Podded	5 8	0 0	13	650	5	510
Barley..... Danish Chevalier......... Pease.......Prince Albert	8 do ... 4 do ...	In early milk.... Podded	0 6	40 0	12	1,375	3	1,725
Rye ....Spring.	7 do ...	In early milk....	4	6	6	1,615	2	150

SEED DISTRIBUTION.

The distribution of seed grain in one and two-bushel lots has increased very much during the past year, and quantities are now sent from the farm to nearly every part of the province. Reasonable prices are charged, and farmers are thankful for the opportunity of buying pure seed grain near home.

Reports regarding the success of the different varieties of seed distributed are now coming in. Nearly all report success with White and Red Connell wheats, and Prize Cluster and Black Tartarian oats, and Duck-bill barley. Unusually large returns are reported from the White Connell wheat, Black Tartarian oats, and two-rowed Duck-bill barley; and all are pleased with the earliness of the Prize Cluster oats.

FODDER CORN.

I have great pleasure in reporting continued success with fodder corn, although the yield during the past season was not nearly equal to that of 1890. It was a very even and profitable crop, and proves conclusively that we need not depend solely on our wild meadows for fodder. With a yield of between 15 and 20 tons of excellent green fodder per acre, mixed farming is practicable even in our high-rolling prairie land, for corn is peculiarly suited to that class of soil.

A trial was made of cutting and binding corn with the common grain binder, and with corn from six to seven feet high it worked quite satisfactorily, and I have no doubt that with an open-backed machine similar to the one introduced this year by the Harris Co., even much taller corn might be cut and bound.

Among the varieties tested this year the most promising for this province, on account of their combining earliness with a fair yield, are North Dakota, White Flint, Red Blazed and Mitchell's Extra Early, the last named being an improved Squaw corn.

All were planted on backsetting 28th May in rows three feet apart and thinned out to six inches in the row. The crop was kept clean during the season of growth with a horse scuffler. All were cut on 29th August, previous to which a frost had injured the upper two feet of the plants, reducing the yield somewhat.

A large proportion of the corn was made into ensilage; the balance was made into stooks by tying the heads together and left in the field to be used dry during the winter. It is readily eaten both as ensilage and in the dry state.

FODDER CORN.

Variety.	Average Height.	Stage of Growth when Cut.	Condition of Ears.	Leafiness.	Yield per Acre.	
	Feet.				Tons.	lbs.
Golden Dent	6 to 6½	Not in tassel	None	Fairly leafy	20	1,250
Thoroughbred White Flint	6 " 6½	Just coming into tassel	do	Very leafy	18	960
Blunt's Prolific	6 " 7	Not in tassel	do	Fairly leafy	18	300
Golden Beauty	6 " 6½	do	do	Not very leafy	17	870
Chester County Mammoth	5 " 5½	do	do	Fairly leafy	17	650
North Dakota	6 " 6½	Silk, dry	Early milk	Very leafy	17	540
Long Yellow Flint	6 " 7	Coming into silk	Nearly formed	do	17	210
Stowell's Evergreen	5 " 5½	In tassel	None	do	16	1,010
King Philip	6 " 6½	In silk	Just formed	Fairly leafy	16	230
Egyptian	5½ " 6	In tassel	None	do	15	1,900
Asylum Sweet	5 " 6	Silk just appearing	Just forming	Very leafy	15	1,680
Red Cob Ensilage	5 " 6	Tassel just appearing	None	Not very leafy	15	1,680
Canada Yellow	5 " 6	In silk	Nearly formed	Very leafy	15	1,350

FODDER CORN—*Concluded.*

Variety.	Average Height.	Stage of Growth when Cut.	Condition of Ears.	Leafiness.	Yield per Acre.	
	Feet.				Tons.	lbs.
Mammoth Southern Sweet......	6 to 6½	Just in tassel ...	None...........	Fairly leafy	15	800
Giant Prolific Ensilage.........	5½ " 6	Not in tassel. ..	do	do	14	1,590
Longfellow	5½ " 6	Silk just appearing.....	Not formed.....	do	14	1,590
Mitchell's Early..........	4½ " 5	Silk, dry	Early milk......	Very leafy at bottom	14	1,260
Red Blazed.....................	6 " 6½	In silk..........	Nearly formed..	Fairly leafy.....	14	50
Pearce's Prolific................	5 " 5½	Silk just appearing.....	Not formed.....	Quite leafy	13	1,610
Pee and Kay....................	5½ " 6	In silk..........	Formed	do	13	1,280
Long White Flint..............	5½ " 6	Silk just appearing...........	Not formed.....	Fairly leafy	13	840
Dakota Gold Coin..............	6 " 6½	Full silk.........	Early milk......	do	13	400
White Flint, from Dakota.....	5½ " 6	Silk nearly dry..	do	Very leafy......	12	530
Yellow Flint	5½ " 6	In silk..........	Nearly formed..	Quite leafy	12	420
Eight-rowed Sugar............	5 " 5½	Silk nearly dry..	Early milk......	Fairly leafy....	12	310
Early Mammoth...............	4½ " 5	In tassel........	None........ ..	Very leafy.....	12	310
Livingstone's Gold Coin.......	5 " 5½	Just in tassel ...	do	Quite leafy	11	880
Potter's Excelsior.............	5 " 5½	In tassel	do	do	11	550
Virginia Horse Tooth	6 " 6½	Not in tassel....	do	Not very leafy..	10	1,120
Extra early Cory.....	4 " 5	Silk nearly dry..	Early milk......	Leafy at bottom.	9	920
Cinquantine.........	5½ " 6	In silk..........	Partly formed ..	Fairly leafy	8	720
White Flint, from Steele	5 " 5½	Silk, green......	Just formed	Leafy at bottom.	15	800

FODDER PLANTS.

In addition to the Indian corn a number of varieties of corn-like millets, &c., were tested; owing, however, to the cool spring and summer, these did not give the yield they otherwise would have done. All were sown on grain stubble with the Planet Junior drill in rows three feet apart, and cut on 11th September, before which date the upper foot of the plants was injured by frost.

These plants have now been tried here on two greatly varying seasons, viz., in 1889, a hot dry summer, and the past season a wet and cool one, and in neither year were they equal to the early varieties of Indian corn, such as Mitchell's Early or North Dakota.

Below will be found particulars of yield, &c., of these plants.

Variety.	Stage of Growth when Cut.	Height when Cut.	Stalk to each Plant.	Yield per Acre of Green Fodder.	
		Inches.	Stalks.	Tons.	lbs.
White Millo Maize..........	Not yet in tassel..........	47	9	8	1,380
Large African Millet..................	do	51	11	7	1,620
Pearl Millet...............	do	43	12	7	740
Chana...........	Seed just appearing..	61	6	7	80
Corn from India............	In tassel	63	6	6	1,200
Mandawar	Not in tassel..............	32	14	5	1,440
Kaffir Corn...........	do	68	9	4	580
Egyptian Rice Corn......	do	54	13	4	360
Yellow Millo Maize.....................	do	49	8	2	1,500

GRASSES.

Great interest continues to be manifested in the experiments undertaken in connection with grasses, nearly every mail bringing inquiries as to the most promising hay and pasture grasses for this country, and the grass plots on the farm receive more attention from visiting farmers than any other department. During the past year large additions have been made to the collection of grasses and clovers undergoing test, and up to the present date 46 varieties of grasses and 10 of clovers have been sown. Of these, 20 of the grasses and 9 of the clovers have experienced a winter; the balance were sown during the past summer, and their hardiness has not been tested. A number of those sown in 1890 were killed out last winter, and no doubt others will succumb during the present severe weather; still, quite a number have proved both hardy and productive, and it is hoped that we shall find among them some varieties well adapted to this country.

CULTIVATED GRASSES SOWN IN 1890.

Below will be found full particulars of cultivated grasses sown with wheat in the spring of 1890. When the wheat was about 2 inches high the grass and clover seeds were sown broadcast and harrowed in, covering the grass seed and killing a lot of weeds at the same time. Nearly all the clover (Common Red) in the timothy and clover mixture was winter-killed and the yield from this plot was light.

Both Sainfoin and Lucerne made a good even stand and came through the winter without injury, but the light rainfall of May was especially severe on them, for both require abundant rainfall early in the season; for this reason the yield from these plots was light.

The Alsike made a good stand the first summer, but about one half of the plants were winter-killed; the remaining plants and the timothy sown with it covered the ground fairly well and the returns were good.

Mammoth Red clover is with us decidedly the most promising of the clovers, coming through the winter without the least injury, and both alone and mixed with timothy gave a good crop of excellent hay; the stalk of this clover grows much finer here than in Ontario, and for that reason makes better hay,

Common Red clover was too tender for the open prairie, the plot of this variety being completely killed out.

White Dutch clover proved to be perfectly hardy, and promises to be quite useful for pasture.

Bokhara or Sweet clover was also hardy, and made a luxuriant growth 7 feet high. Although of very little use for fodder it is an excellent honey plant, and the perfume from its blossom was quite noticeable for the greater part of the summer.

Trefoil and Crimson clover with us were both winter-killed.

Austrian Brome Grass (*Bromus inermis*) is a very promising grass here. This did not winter-kill the least, grew 32 inches high and yielded 2½ tons of excellent leafy hay.

Orchard Grass grew thick on the ground, but was rather short; it stood the winter, and keeps green quite late in the season, the aftermath from this variety being heavier than from any of the others.

Timothy covered the ground well, but failed to push up a proper proportion of stalks, and the crop was light; this is the general complaint from farmers regarding this grass, and for that reason its cultivation is not general.

All the Fescues proved hardy, but only the Meadow Fescue gave a fair return; this is a very promising grass, but should not be sown alone.

The following grasses were winter-killed:—Rough Meadow grass, Italian Rye grass, Perennial Rye grass and Meadow Fox-tail.

The plots were one-tenth of an acre in area; soil, rich sandy loam; all were cut about 15th July, but some of them should have been cut earlier.

GRASSES and Clovers sown with Wheat in 1890.

——	Height.	Yield, dry, per Acre.		Remarks.
		Tons.	lbs.	
Mixed native grass	43 inches.	2	1,058	Injured by wind; excellent hay.
Mixed cultivated grasses	34 do	1	625	Orchard and Timothy most prominent.
Austrian Brome grass	32 do	2	1,105	Very promising; hardy.
Orchard grass	28 do	2	200	Heavy bottom.
Meadow Fescue	25 do	1	666	Good pasture grass.
Sheep do	12 do	Not cut.		Only fit for pasture.
Hard do	18 do	do		do do
Timothy and clover	34 do	1	1,942	Clover nearly all killed.
Mammoth clover and timothy	28 do	2	1,505	Quite hardy; nice crop.
do (alone)	28 do	2	1,117	do do
Alsike and timothy	24 do	2	529	One half Alsike killed.
Sainfoin	26 do	1	1,529	Even crop; hardy.
Lucerne	26 do	1	844	do do
Bokhara clover	7 feet	Not weighed.		Excellent bee plant.
White Dutch clover	12 inches.	Not cut.		Good pasture.
Common Red do				Winter-killed.
Trefoil				do
Italian Rye grass				do
Perennial do				do
Meadow Fox-tail				do
Rough Meadow grass				do

SOME NEW VARIETIES OF GRASSES.

A very interesting collection of grasses, many of them quite new to this district, was received in early spring from Mr. J. Fletcher, Botanist at the Central Experimental Farm. The seed of every variety grew and the collection was a source of interest to visiting farmers all through the season; many varieties made a large growth, and I trust some of them will prove hardy and worthy of cultivation in this province.

All were sown in double rows 25 feet long; the plants of desirable varieties will be pricked out and transplanted into beds during the coming season. Accompanying this will be found a table showing the percentage of germination, growth, &c., of these grasses.

GRASSES sown 2nd June, 1891; seed from Experimental Farm.

Variety.	Percentage Germinated.	Growth made in 1891	Remarks.
	Per cent.	Inches.	
Bromus segetum	100	24	Seed ripened.
Bromus inermis	100	20	do
Elymus dasystachys	10	2	
Muhlenbergia Mexicana	100	15	Seed ripened; bunchy.
Sporobolus heterolepis	30	2	
Bromus Pumpellianus	100	14	Bunchy.
Deyeuxia neglecta, var. robusta	90	9	
Deyeuxia Canadensis	60	2	
Poa nevadensis from N. W. T.	90	3	
Poa pratensis from Forres	100	9	
Poa compressa	100	14	Seed ripened.
Muhlenbergia sylvatica	100	16	Seed ripened; bunchy.

GRASSES sown 2nd June, 1891, &c.—*Concluded.*

Variety.	Percentage Germinated.	Growth made in 1891	Remarks.
	Per cent.	Inches.	
Muhlenbergia glomerata	100	16	Seed ripened.
Phalaris arundinacea	100	20	
Boutelouia oligostachya	100	6	do
Panicum virgatum	90	13	
Elymus Canadensis	100	6	
Hierochloa borealis	90	6	
Deyeuxia neglecta	90	9	
Deschampsia flexuosa	90	9	
Deschampsia cæspitosa	90	9	
Agropyrum tenerum	90	6	
Agropyrum glaucum	100	9	
Apluda aristata	40	....	From seed sent in 1890.
Panicum ciliare	90	....	do do
Panicum colonum	30	....	do do
Koeleria cristata	None.	....	do do
Andropogon pertusus and annulatus (mixed)	do	....	do do
Eleusine Indica	do	....	do do
Eragrostis poæordis	do	....	do do

NATIVE GRASSES GROWN UNDER CULTIVATION.

In the spring of 1889 eight small plots were sown with grass seeds gathered on the prairie here; these plots have not been re-sown since, and there is now no question as to the perennial character of these grasses, for they have improved every year since sown, and the yield from them this year was in most cases very large.

As all the seed obtainable was required to enlarge the work of this department none of the plots were cut in the green state, and the yields given are obtained from the ripe hay cut for seed. About 250 lbs. of seed was gathered and will be sown in large plots next spring.

About 2 acres was sown with the seed obtained from these plots in 1890; it made a good catch, and next fall we hope to have a quantity of seed for distribution among farmers.

As the plots from which the following returns were taken were small and kept perfectly free from weeds, such large returns must not be expected from ordinary field culture.

No manure was used on any of the plots.

NATIVE GRASSES.

Variety.	Height.	Hay Stage.	Seed Ripe.	Yield per Acre.
	Inches.			
Agropyrum tenerum, Vasey	41	July 4	August 7	2 tons, 1236 lbs.
Agropyrum caninum, R. and S.	43	do 4	do 22	2 do 827 do
Poa serotina, Ehrh	28½	do 1	do 1	Very thin, not cut.
Elymus Virginicus, L.	40	do 26	do 22	3 tons, 306 lbs.
Elymus Americanus, V. and S.	48	do 15	do 28	3 do 618 do
Phalaris arundinacea	35½	do 6	do 1	2 do 100 do
Bromus ciliatus, L.	50	do 24	do 22	2 do 1,833 do
Muhlenbergia glomerata, Trin.	31	do 26	do 22	2 do 1,621 do

I have also pleasure in acknowledging the receipt from S. Robinson, Esq., of a collection of clover and grass seeds brought by him from Scotland last spring. These proved to be of extra good quality, nearly all germinating. Many are, however, of tender varieties, and their survival through the present severe winter is doubtful.

Below will be found particulars of this collection.

GRASS and Clover Seed received from S. Robinson, Esq., Wawanessa, Man., sown 2nd June, 1891.

Variety.	Approximate Percentage Germinated.	Growth made in 1891.	Remarks.
	Per cent.		
Italian Rye grass (Scotch seed)	100	16 inches...	Very vigorous.
do (Foreign seed)	100	16 do ...	do
Perennial Rye grass	100	14 do ...	
Cocksfoot	100	16 do ...	
English Red clover	100	20 do ...	Seed ripened.
English Cow Grass clover	100	20 do ...	do
Alsike clover	100	22 do ...	do
White do	100	Rank & close..	do
Yellow do	100	30 inches...	do
Large Scotch tares	100	40 do ...	Annual.

MILLETS AND HUNGARIAN GRASS.

Eleven plots were devoted to experiments with millets, as there is a difference of opinion regarding the merits of thick and thin sowing for this plant. Three sowings were made of each of the leading millets, one each of 15, 20 and 25 lbs. per acre. This test of the German and common millet was spoilt; that with Hungarian was complete, and points to 20 lbs. of seed per acre as the right quantity. Tests of rolling directly after sowing were also made with satisfactory results. All were sown on the 29th May and cut on the 29th August. The past summer was too cool for a large return from millets.

Variety.	Quantity of Seed per Acre.	Yield of Hay.		Remarks.
	Lbs.	Tons.	lbs.	
Hungarian grass	15	2	1,350	Rather thin.
do	20	2	1,850	About right thickness.
do	25	2	1,350	Too thick on the ground.
German millet	20	2	1,700	About the right thickness.
Common do	20	2	1,400	do do
Hungarian grass (rolled)	20	2	1,920	Came up first.
do (not rolled)	20	2	1,700	Slower to germinate than the above.

RENEWING OF OLD MEADOWS.

It is found in many parts of the province that natural hay meadows after a few years cutting become infested with useless and often bitter weeds, which crowd out the grasses, until the meadows have to be abandoned.

On this farm a portion of the natural meadow was so overgrown with Pennsylvanian wind flower (*Anemone dichotoma*), and small sage bush (*Artemisia Ludoviciana*), both native plants, that it is no longer cut with profit. This portion of the meadow has been broken up, and after growing one crop of grain will be re-seeded with different varieties of grasses, and the result noted and reported on.

SILOS.

The two silos built in the west end of the barn were filled during the past season, as follows:—The lower one-third of the north one with green oats and pease uncut, and the upper two-thirds with fodder corn cut in 1-inch lengths; the lower half of the south silo was filled with millet uncut, and the upper half with cut fodder corn.

For the corn a Watson cutting-box with elevating attachments was used, and gave entire satisfaction; the cutting-box was run by our Abell two-horse tread machine, and there was no lack of power, the corn being cut and elevated as fast as two men could feed it.

Although the sides and corners of the silos were well tramped, while being filled, the ensilage settled so much that it was necessary to fill it several times. After the last filling a 2-foot coating of wheat chaff was put on over the ensilage, but no weights were used. On the 15th December the north silo was opened, and the ensilage found to be of excellent quality, with scarcely any waste on the sides or in the corners.

There being no roof over the silos, some inconvenience was experienced from frost, when the chaff covering was removed; this was overcome by the use of a false roof made of loose boards, tar paper and about 2 feet of chaff; this was found effectual in excluding the frost, and since then the cattle have been fed regularly on the ensilage with satisfactory results.

CATTLE.

During October last I visited Ontario and brought back a selection of 15 head of cattle for breeding and experimental purposes on this farm. These consisted of Shorthorns, Galloways, Holsteins and Ayrshires; nine of them were taken from the herd at the Central Experimental Farm and the balance purchased from breeders in Ontario.

All reached here safely and have remained in good health and gained rapidly in flesh since their arrival. Already a large number of farmers have inspected the stock, and all have expressed their appreciation of the efforts being made through the experimental farms to improve the stock of the country.

SHORTHORNS.

From Mr. W. S. Hawkshaw, Glanworth, Ont.:

One bull, General H, =14574=; colour, red; calved 15th December, 1890; bred by W. S. Hawkshaw, Glanworth, Ont.; got by Aberdeen Hero, (imp.) dam, Countess of Hawkhurst, =8752=; by 3rd Duke of Rutland, =559=; Countess 2nd =784=.

From the Central Experimental Farm, and purchased originally from Mr. Thos. Guy, Oshawa, Ont.:

One cow. Rose of Sydenham =16031=; colour, red; calved 6th February, 1886; bred by Thomas Guy, Oshawa, Ont.; got by Samson, =8787=;—dam, Red Rose, =4450=; by Enterprise 2nd =1769=; Sally =4728=.

One heifer, Cowslip 4th; calved 7th March, 1890; bred at Central Experimental Farm, Ottawa; sire Rosy Prince 8th =9198=;—dam, Cowslip 3rd =16646=.

One heifer, Rose of Darlington; calved 24th July, 1890; bred at Central Experimental Farm, Ottawa; sire, Rosy Prince 8th =9198=;—dam, Countess of Darlington 12th =14193=.

One heifer calf, Fashion 9th; calved 5th March, 1891; bred at Central Experimental Farm, Ottawa; sire, Earl of Kinsale = =; got by Premier Earl (imp.);—dam, Fashion Book =15918=.

AYRSHIRES.

From D. Morton & Sons, Hamilton, Ontario:

One heifer, Jewell =2003=; calved 14th June, 1889; colour, white and brown; bred by Hugh Jack, Little Shewalton, Irvine, Scotland; sire, Dandy Jim (1579), dam, Judy (imp.) (5505); by Red Prince (1000); Mirley (2672).

From D. Morton & Sons, Hamilton, Ontario:

One heifer, Dandy 2nd =2004=; calved 6th April, 1889; colour, brown and white; bred by Hugh Jack, Little Shewalton, Irvine, Scotland; sire, Dandy Jim (1579);—dam, Dandy 1st (5502), by Red Prince (1000); Dandy of Shewalton (2688).

Dandy 2nd took second prize at Toronto in 1891.

From Kains Bros., Byron, Ont.:

One bull, Middlesex =1216=; calved 10th September, 1890; colour, red and white; bred by Kains Bros., Byron, Ont.; sire, Prince of Byron =583=;—dam, Jeanie of Auchenbrain (Imp.) =129=, by Duke 3rd =647=; Paisley, by Wallace of Doumlanrig =61=, Gray Kate by Rob.

HOLSTEIN FRIESIANS.

From A. E. Hallman & Co., New Dundee, Ontario:

One cow, Queen of Waterloo =14666=, H. F. H. B.; calved 12th April, 1888; colour, white with black markings; bred by A. E. Hallman & Co., New Dundee, Ont. sire, African Prince =1270=, H.F.H.B.;—dam, Mina Rooker 2nd =3742=, H.F.H.B.

Queen of Waterloo took 1st prize as a 2-year-old at London and Toronto in 1890.

From A. E. Hallman & Co., New Dundee, Ontario:

One cow, Princess Leda 2nd, H.F.H.B. =18510=; calved 6th January, 1889; colour, black with white markings; bred by Smith, Powell & Lamb, Syracuse, N.Y., sire, Netherland Monk =4424=, H.H.B.A.R.;—dam, Princess Leda 1st =7130=, H.F.H.B.

From the Central Experimental Farm, Ottawa:

One bull, Holland Prince; calved 31st August, 1890; colour, mostly black, with white markings; bred at the Central Experimental Farm, Ottawa; sire, Netherland Pythius =9167=, H.F.H.B.;—dam, Aaggie Cornelia, 2nd Netherland =12217=, H.F.H.B.

GALLOWAYS.

From the Central Experimental Farm, purchased originally from Mr. Thos. McCrae, Guelph, Ont.:

One bull, Chester (4472); calved 12th March, 1887; bred by Thomas McCrae, Guelph, Ont.; sire, Stanley III (1793);—dam, Chrissy (7099).

NOTE.—Stanley III, imported by Agricultural College, Guelph; and Chrissy imported by Thos McCrae.

One cow, Violet III, of Tarbreoch (9675); calved 30th March, 1886; bred by James Cunningham, Tarbreoch, Dalbeattie, Scotland; sire, Scottish Borderer (669);—dam, Maid III, of Tarbreoch.

NOTE.—This animal was a prize winner at the Highland Agricultural Society's Show in Scotland.

One cow, Hannah B., of Guelph (11080); calved 23rd February, 1888; bred by Thos. McCrae, Guelph, Ont.; sire, Stanley II (4473);—dam, Hannah III, of Castlemilk (7699); by Beaconsfield (1344);—dam, Hannah V (1421).

One bull-calf, "McCrae"; calved 14th March, 1891; bred at Central Experimental Farm, Ottawa; sire, ;—dam, Violet III, of Tarbreoch (9675).

EXPERIMENTS IN FEEDING STEERS AND SWINE.

Besides the cattle brought from Ontario, eight grade steers are being fed with different classes of food. These experiments will be continued during the winter and the results made known in the next report.

Experiments in feeding swine with barley and frozen wheat have also been undertaken, but are not yet completed.

HORSES.

The horses on the Experimental Farm are enjoying perfect freedom from disease. It is now over three years since they were brought to the province, and since that time none have died and no serious ailment has occurred among them. Their healthfulness is no doubt largely owing to the pure water found on the farm and the care taken in feeding, &c. When in full work, each horse is fed two meals per day of oats mixed with bran, and one meal (at night) of crushed grain, besides all the wild meadow hay they can eat up clean. On Sunday one-half the usual quantity of oats is fed.

EXPERIMENTS WITH TURNIPS.

Of the thirty-nine varieties of turnips tested during the past season the Mammoth Purple Top has given the largest yield and the best shaped turnip. Owing to the unfavourable season many of the varieties were very long in the neck, but the roots of the above variety were nearly all perfect in shape.

All were grown in rich loam soil in the lower portion of the valley. The sowing was done with the Planet Jr. drill, in level drills 30 inches apart.

Two sowings were made, one on the 15th May and the other two weeks later. The first sowing was nearly destroyed by cut-worms just as the plants appeared above ground. Several remedies were tried, and air-slacked lime applied near the plants appeared to do the most good, but in spite of all we could do the first sowing was nearly destroyed. The second sowing escaped injury from this cause, but the crop was somewhat late for the best results. All were pulled on the 22nd October.

The returns given were calculated from weighing three rows, each 66 feet long.

Variety.	Yield per Acre.	Yield per Acre.	
	Bush.	Tons.	lbs.
Highland Prize (Simmers)	833 $\frac{48}{60}$	25	28
Imperial (Webb)	805 $\frac{12}{60}$	24	312
Mammoth Purple Top (Evans)	770	23	200
Elephant or Monarch (Steele)	765 $\frac{36}{60}$	22	1,936
Selected Purple Top (Steele)	721 $\frac{36}{60}$	21	1,296
New Giant King (Webb)	719 $\frac{24}{60}$	21	1,164
Marquis of Lorne (Bruce)	719 $\frac{24}{60}$	21	1,164
Clyde Improved (Evans)	712 $\frac{48}{60}$	21	768
Bangholm (Simmers)	712 $\frac{48}{60}$	21	768
Hartley's Bronze (Pearce)	688 $\frac{36}{60}$	20	1,316
Purple Top Swede (Rennie)	677 $\frac{36}{60}$	20	656
Skirving's Swede (Steele)	660	19	1,600
Carter's Elephant (Bruce)	576 $\frac{24}{60}$	17	584
Turnips—Garden Varieties.			
Long White Verties	847	25	820
Early White Stone	843 $\frac{20}{60}$	25	600
Early Six Weeks	748	22	880
Orange Jelly	726	21	1,560
White Globe Strapleaf	718 $\frac{40}{60}$	21	1,120
Red Top Strapleaf	597 $\frac{40}{60}$	17	1,860
Burpee's Breadstone	586 $\frac{40}{60}$	17	1,200
Extra Early Milan	498 $\frac{40}{60}$	14	1,920
Sweet German	454 $\frac{40}{60}$	13	1,280
Early White Flat Dutch	451	13	1,060
Lang's Improved Purple Top	396	11	1,760
Hasyard's Improved	359 $\frac{20}{60}$	10	1,560

GROWN from Seed sent to the Farm by Mr. Stewart Robinson, Wawanessa.

Variety.	Yield per Acre.	Yield per Acre.	
	Bush.	Tons.	lbs.
Mammoth Purple Top	$975\frac{20}{60}$	29	520
Devonshire Grey Stone	$894\frac{40}{60}$	26	1,680
Old Muldrum Green Top Yellow	748	22	880
Wosterton Hybrid	$623\frac{20}{60}$	18	1,400
Aberdeen Green Top Yellow	528	15	1,680
Pomeranian White Globe	$498\frac{40}{60}$	14	1,920
Sutton's Champion Swede	$491\frac{20}{60}$	14	1,480
Drummond's Improved	418	12	1,080
Sharpe's Improved	$388\frac{40}{60}$	11	1,320
East Lothian Purple Top	374	11	440
Green Top Swede	374	11	440

From Seed sent to the Farm by R. Waugh, 1890.

Dads Improved East Lothian Swede, seed saved in Kent, England	$498\frac{40}{60}$	14	1,920
do do do East Lothian	$381\frac{20}{60}$	11	880
Purple Top Swede	$425\frac{20}{60}$	12	1,520

POTATOES.

One hundred and eleven varieties of potatoes were tested on the farm during the past season; of these, forty varieties were grown in such small quantities that returns are not available this year.

All were planted on 23rd May, in rows 3 feet apart, and 1 foot apart in the row, and all were dug on 12th October.

The following list of twenty-four varieties were selected from among the most promising of those grown at the Central Experimental Farm; the quality of nearly all of them was found to be good, and a number of them have under the circumstances given fair returns.

POTATOES.

Variety.	Growth of Plant.	Size of Tuber.	Quality.	Flavour.	Ripe.	Colour.	Yield per Acre.
							Bush.
Vanguard	Fair	Large	Very dry	Good	Late	Red	214
Early Puritan	Strong	do			do	White	209
Delaware	do	Medium	Dry	Good	do	do	203
Early Rose	Fair	Large	do	do	do	Red	192
Empire State	Strong	do	Wet	Poor	do	White	191
Halton Seedling	Fair	Medium	Dry	Good	Sept. 1	Red	183
Algoma No. 1	Weak	Large	Extra dry.	do	Aug. 15	do	176
London	Fair	Medium	Dry.	do	Late	do	172
Lee's Favourite	do	do	do	do	Sept. 1	Light red.	170
Beauty of Hebron	Weak	do	do	do	do 1	do	168
May Queen Early	Strong	do	do	do	do 3	Red	168
Thorburn	Fair	Large	do		Late	do	163
Clarke's No. 1	do	Small	Fair	Fair	do	Light red.	163
Early Eating	Weak	Large					154
Early Maine	Fair	do	Very dry	Good	Sept. 1		150
Rural Blush	Strong	Very large	Fair	do	Late	Red	148
Rural New Yorker No. 2	do	Large	Wet	Poor	do	White	137
Chicago Market	Fair	Very large	Dry.	Good	do	Red	137
Rose's New Giant	do	do	Fair	do	do		133
White Star	Strong	Medium	Wet	Poor	do	White	133
Early Ohio	Fair	do	Dry	Good	Sept. 1		126
Ohio Gunner	Weak	Large	do	do	Aug. 15	Red	119
Brownell's Winner	Strong	Medium	Wet	Poor	Late	Dark red.	102
Vermont	Fair	Large	Dry	Good	Sept. 1	Red	113

The location selected for potatoes this year was strong low-lying land, and unsuitable for a season like the past one. Although planted on 23rd May, many were not above ground by 15th June, and all were very backward in consequence; for that reason the dates given for their ripening would be different if grown under more favourable conditions. Those marked *late* were not ripe when cut down by frost.

The yields per acre are calculated from weighing the produce of two rows 66 feet long.

A number of the varieties tested last year were found undesirable and were discarded. The following list includes the most promising of the varieties tested in 1890, among them a number of seedlings raised on the Central Experimental Farm. One of them, No. 80, has again given much the largest yield of any potato grown on this farm. It is proposed to grow this variety more extensively next season.

POTATOES.

Variety.	Growth.	Size.	Quality.	Flavour.	Ripe.	Colour.	Yield per Acre.
							Bush.
C. E. Farm, No. 80	Strong	Fair	Fair	Fair	Late		335
Richter's Imperator	do	do	do	do	do	White	209
Alpha	Fair	Medium	do	Good	do	do	191
Rosy Morn	Weak	do	Wet	Poor	Sept. 10	Red	188
Stray Beauty	Fair	do				do	183
Crown Jewel	do	do	Dry	Good	Late	do	179
Richter's Schneerose	do	do	Fair	Fair	do	White	177
White Elephant	do	do	do	do	do	do	159
New Badger State	Strong	do	Wet	Poor	do	do	149
C. E. F., No. 188	Fair	Small	do	do	do	do	148
Thorburn's Late Rose	Strong	Large	Fair	Good	do	Red	146
Wonder of the World	Fair	Medium	do	Fair	Sept. 10	do	141
C. E. F., No. 94	do	do	Wet	Poor	Late	White	141
Early Callao	do	do	do	do	do	do	141
Amon's Early	do	Small	Dry	Good	do	Red	137
Jackson's Improved	Strong	do	Wet	Bad	do	White	135
C. E. F., No. 9	Fair	Medium	Fair	Good	do	do	135
Thorburn's Paragon	Weak	do	Dry	do	do	Red	132
Early Rose	Fair	do	do	do	do	do	130
C. E. F., No. 225	do	do	Wet	Poor	do	White	128
Brownell's Best	do	Large	do	do	do	do	126
Jumbo	Weak	do	Fair	do	do	do	121
C. E. F., No. 118	do	Small	Wet	Fair	Sept. 1	do	117
St. Patrick	do	Large	Very wet	Poor	Late	Red	110
C. E. F., No. 53	Strong	Medium	Fair	Fair	do	Blue	108
do 170	Fair	Small	do		do	do	108
do 54	Weak	Medium	Dry	Good	Sept. 10	Red	106
Taylor's Prolific	Fair	Large	Wet	Poor	Late	do	106
C. E. F., No. 195	do	Small	Fair	Fair	do	White	104
Pride of America	Weak	Medium	do	do	Sept. 10	Light red	100
Lady Finger	Strong	Small	do	Good	Late	White	100
C. E. F., No. 231	do	do	Wet	Poor	do	Blue	99
do 141	Fair	do	do	do	Sept. 15	White	97
Snow flake	do	Large	Fair	Fair	do 15	do	95
C. E. F., No. 263	Strong	Medium	Wet	Poor	Late	do	91
Genessee Seedling	Fair	Large	Dry	Good	do	do	91
C. E. F., No. 83	Strong	Small	Wet	Poor	do	Blue	81
do 209	Fair	do	do	do	do	White	81
do 153	Strong	do	do	do	do	R. blue	80
do 5	Fair	Medium	Dry	Good	do	White	77
do 73	Weak	Small					73
Lee's Favourite	Fair	Large	Dry	Good	Sept. 1	Red	71
C. E. F., No. 98	Strong	Medium			Late	White	58
do 73	Weak	Small	Fair	Fair	do	do	40
do 118 A	Fair	do	Wet	Poor	do	do	31
Asparagus	Weak	Very small	Fair	Fair	do	do	20

MANGELS.

Fifteen varieties of this useful vegetable were grown on this farm; the land selected for the purpose was a deep rich loam, but somewhat too moist for the season. Each variety was sown with a Planet Jr. drill, in level drills 30 inches apart. The first series of plots were sown on the 15th May, and were destroyed by the same cut-worm that worked among the turnips; the second sowing was made two weeks later; these were only slightly injured by the cut-worm.

All were pulled on the 4th October, and are being fed to the milking cows on the farm.

The yields given were calculated from weighing the produce of three rows, each 1 chain long.

EXPERIMENTS WITH MANGELS.

Variety.	Yield per Acre.		
	Bush.	Tons.	Lbs.
Carter's Warden Orange Globe.... ....(Bruce)	1012	30.	720
Mammoth Long Red.... ....(Evans)	$950\frac{24}{60}$	28	1,024
Pearce's Canadian Giant.... ....(Pearce)	$822\frac{48}{60}$	24	1,368
Gate Post.... ....(Bruce)	$822\frac{48}{60}$	24	1,368
Mammoth Long Red.... ....(Simmers)	814	24	840
New Giant Intermediate.... ....(Steele)	$800\frac{48}{60}$	24	48
New Giant Yellow Globe.... ....(Bruce)	792	23	1,520
Mammoth Long Red.... ....(Steele)	$778\frac{48}{60}$	23	728
Champion Yellow Globe.... ....(Webb)	$748\frac{40}{60}$	22	880
Golden Tankard.... ....(Evans)	$730\frac{24}{50}$	21	1,824
Mammoth Long Red.... ....(Webb)	$739\frac{12}{60}$	22	352
Yellow-fleshed Tankard.... ....(Webb)	$695\frac{12}{60}$	20	1,712

EXPERIMENTS WITH CARROTS.

Fourteen varieties of carrots have been tested during the past season. The first series of plots were sown on 12th May and the second on the 26th May. All were pulled on 24th October. The seed was sown with a Planet Junior drill in level drills, 18 inches apart, in deep rich loam. The plots were on rather low land and were injured somewhat by heavy rains. The yields were calculated from weighing the produce of three rows, each 66 feet long.

Variety.	Yield of Plot sown May 12.			Yield of Plot sown May 26.		
	Per Acre.	Per Acre.		Per Acre.	Per Acre.	
	Bush.	Tons.	lbs.	Bush.	Tons.	lbs.
Improved Short White (Steele)......	$425\frac{20}{60}$	12	1,520	374	11	440
Large White Vosges (Bruce)......	418	12	1,080	396	11	1,760
Green Top Orthe (Pearce)......	$410\frac{40}{60}$	12	640	$381\frac{20}{60}$	11	880
Large White Vosges (Simmers)...... ..	396	11	1,760	418	12	1,080
Mammoth Intermediate White (Rennie)...........	$381\frac{20}{60}$	11	880	....	....	....
Chantenay (Bruce)......	$366\frac{40}{60}$	11	....	$366\frac{40}{60}$	11	....
James Intermediate (Pearce)......	$366\frac{40}{60}$	11	....	308	9	480
Guerande or Ox Heart((Steele)...	352	10	1,120	$381\frac{20}{60}$	11	880
Early Gem (Rennie)......	$344\frac{40}{60}$	10	680	$366\frac{40}{60}$	11	....
Giant Short White Vosges (Rennie).....	$337\frac{20}{60}$	10	240	$366\frac{40}{60}$	11	....
Yellow Intermediate (Webb)......	$322\frac{40}{60}$	9	1,360	....	....	....
Mitchell's Perfection (Pearce).	$300\frac{40}{60}$	9	40	$293\frac{20}{60}$	8	1,600
Half Long Scarlet Luc (Rennie)......	$234\frac{40}{60}$	7	80	$432\frac{40}{60}$	12	1,960
Scarlet Altringham (Webb)......	200	6	1,200	$315\frac{20}{60}$	9	920

APPLES.

In the fall of 1890 all apple trees then living were wrapped in straw and tar paper for protection during the winter and early spring. On 15th April, 1891, this covering was removed, and it was found that most of the trees had come through the winter with little or no injury. From the 15th to the end of April the weather was warm, and caused the trees to swell their buds very rapidly. During the second week in May several very sharp frosts occurred, causing great injury to all the fruit trees in their then advanced stage of growth. From the effects of this severe check, nearly all lost a considerable part of their wood, and several trees were killed. Since then the season has been very favourable, and apple trees have all made good growth, and most of the wood is well ripened.

Four hundred apple trees, comprising 140 varieties, were planted in 1889; of these 272, of 102 varieties, are still growing. Although growing slowly, some of the trees are apparently quite hardy, and the severe cold of winter does not affect them. They are still very young and have not yet borne fruit.

These trees were procured from various sources, and it is noticeable that the farther north the trees have been raised the more hardy they are here. The seedlings raised at Ottawa from seed procured in Russia, and planted here in the spring of 1890, are very promising. Although unprotected, they came through last winter and spring without injury, and it is hoped that from these some varieties may be obtained that will grow successfully in this province.

From the following tables it will be seen that very few apple trees have been lost during the past year. Where trees had died in the orchards, they have been replaced by others from the nursery rows, and an additional orchard has been planted with 100 trees, placed 10 feet apart.

APPLE Trees growing in Bush form, on low Stems.

Name of Variety.	No. of Trees Living. 1890.	1891.	Present Condition.	Season's Growth.
Anisim	4	4	Good	14 inches; hardy growth.
Autumn Streaked	5	5	do	20 do extra hardy.
Broad Green	2	2	Extra good	18 do hardy growth.
Blushed Calville	5	3	do	22 do do
Christmas	2	2	Fair	Small do
Cross	2	2	do	do do
Crooked Spice	1	1	Good	14 inches do
Duchess of Oldenburg	10	10	do	38 do extra hardy.
Grandmother	9	8	do	16 do do do
Krimskoe	2	1	Poor	Small.
Koursk Anis	3	3	Fair	do hardy.
Koursk Reinette	1	1	Good	14 inches do
Karabovka	2	1	Fair	Small.
Kruder	1	1	do	do
Kremer's Glass	1	1	do	do
Lejanka, or Liebig	13	13	Extra good	18 inches; very hardy growth.
Osimoe	1	1	Good	14 do hardy growth.
Orel, No. 5	1	1	do	11 do do
do 11	1	1	do	16 do do
Ostrokoff's Glass	4	3	Fair	10 do
Pineapple	3	3	do	14 do
Plikanoff	9	9	Good	22 do extra hardy.
Russian Green	1	1	Fair	Small.
Repolovka	2	2	do	do hardy growth.
Red Repka	4	4	do	14 inches do
Romna	8	6	Good	11 do do
Red Anis	14	14	Very good	30 do extra hardy growth.
Sandy Glass	1	1	Poor	Small, killed back.
Sugar Sweet	2	2	Fair	10 inches.
Silken	4	4	Good	16 do hardy growth.
Simbirsk, No. 1	2	2	do	10 do do

Apple Trees—*Continued.*

Name of Variety.	No. of Trees Living. 1890.	1891.	Present Condition.	Season's Growth.
Simbirsk, No. 2	2	1	Good	14 inches ; hardy growth.
do 6	2	0		
do 9	2	2	Good	11 do do
Tashkin	2	2	do	16 do do
Tiesenhausen	1	1	Very good	20 do do
Titovka	8	8	do	18 do extra hardy growth.
Ukraine	4	3	Good	14 do hardy growth.
Vargulek	4	3	do	12 do do
White Pigeon	1	1	do	14 do do
Yellow Arcadian	2	2	do	10 do do
Yellow Anis	9	9	Very good	16 inches ; extra hardy.
Yellow Sweet	1	1	Poor	Small.
Zusoff	2	2	Good	10 inches ; hardy growth.
Russian Seedlings	340	340	Very promising	24 do extra hardy.

The following were tall standard trees, nearly all of which are now being grown in bush form from lower part of stem, as the bare stems in the standard form were found to suffer severely from sun-scald :—

Antonovka	6	5	Good	16 inches ; hardy growth.
Arabka, summer	2	2	Very good	22 do do
do winter	2	2	Fair	10 do do
Anis	3	2	Good	14 do do
do red	1	1	do	18 do do
do mottled	2	1	Poor	Small.
Aport	4	4	Good	30 inches ; hardy.
Alexander	6	4	Fair	18 do kills back.
Blue Pearmain	1	1	do	8 do do
Ben Davis	4	3	Good	14 do
Borovinka	2	2	do	28 do hardy growth.
Canada Baldwin	4	3	Fair	26 do kills back.
Duchess of Oldenburg	4	4	do	18 do do
Fameuse	3	3	Poor	Small do
Gipsy Girl	4	3	Good	16 inches ; hardy growth.
Grand Duke Constantine	2	1	Fair	30 do
Golden White	2	2	Good	15 do do
German Calville	1	1	Poor	12 do kills back.
Golden Russet	3	2	Fair	32 do do
Grimes Golden	1	1	do	28 do do
Hibernal	4	4	Good	16 inches ; hardy growth.
Herren	3	1	Fair	10 do
Haas	1	1	Good	38 do do
Enormous	2	1	Fair	Small.
Bogdanoff's Glass	2	1	Good	40 inches ; kills back.
Kellogg Russett	2	1	Poor	10 do do
Lead	2	2	Good	24 do
Livland Raspberry	1	1	do	24 do
Longfield	4	4	Fair	16 inches ; hardy growth.
Mann	2	1	do	27
McIntosh Red	4	2	Poor	10
Pointed Pipka	2	2	Very promising	19 do extra hardy growth.
Peach	2	2	Fair	34 inches ; kills back.
Red Bietigheimer	1	1	do	16 do do
Red Astrachan	2	2	do	16 do do
Steklianka	2	2	Good	30 do
Serinkia	1	1	do	40 do
Scott's Winter	2	1	do	40 do kills back.
Switzer	2	2	Fair	26 do do
Stettin Yellow	1	1	Poor	11 do do
Shaker Pippin	2	2	Fair	16 do do

APPLE TREES—*Continued.*

Name of Variety.	Trees Living. 1890.	Trees Living. 1891.	Present Condition.	Season's Growth.
Tetofsky	3	3	Good	10 inches.
Titovka	2	2	do	30 do
Talman's Sweet	1	1	Fair	24 do kills back.
Ukraine	2	2	Good	32 do hardy growth.
Vargul	1	1	Fair	Small.
White Borodovka	1	1	Good	34 inches.
Winter St. Lawrence	2	2	do	16 do
Wallbridge	2	1	Poor	Small.
Wealthy	2	2	Good	17 inches.
Yellow Transparent	5	2	Fair	14 do

CRAB APPLES.

Thirty-five crab apple trees were planted in 1889, of which 26 are still living, and are now making a promising, hardy growth.

So far as tree-growth is concerned, the Transcendant, Hyslop, Whitney's No. 20, and Orange varieties of crab apples will eventually succeed in this province, but our trees being very young have not yet borne fruit.

The following are growing as tall Standards on single upright stems :—

Name of Variety.	Trees Living. 1890.	Trees Living. 1891.	Present Condition.	Season's Growth.
Transcendant	9	9	Very good	28 inches; hardy and very promising.
Whitney's No. 20	3	3	do	24 inches; very hardy.
Hyslop	7	7	do	24 do do
Orange	2	2	do	27 do hardy and very promising.
Early Strawberry	2	2	Fair	14 inches; kills back.
Queen's Choice	2	1	do	18 do do
Lou's Favourite	1	1	Good	18 do hardy.
Martha	1	1	Fair	16 do

CHERRIES.

Of 13 cherry trees planted in 1889, all have been winter-killed, excepting two trees of the Ostheim variety, which are still growing from roots.

Twenty trees of Russian varieties were planted in the spring of 1890, and of these 12 are still living, and appear to be of a more hardy class than those first planted.

Name of Variety.	Trees Living. 1890.	Trees Living. 1891.	Present Condition.	Season's Growth.
Bessarabian	4	2	Good	Small.
Lutovka	5	5	do	10 inch.
6m. Cherry	4	2	do	12 in.; hardy growth.
12m. do	2	1	Fair	Small.
Koslov Bush Morello	5	4	Good	10 inch.; hardy growth.

PLUM TREES.

Although it has come under my notice that some of the improved wild varieties of plums are being successfully grown in parts of this province, the result of our trials with this fruit so far have not been satisfactory.

The standard trees planted in 1889 were all killed back to the snow line, and although they made good growth again during the summer of 1890, the new wood was again killed back last winter.

A few small northern-grown trees of the De Soto and Early Red varieties, planted in 1889 and 1890, have been more successful; their growth being hardier, they have not suffered so much from the effects of winter.

Name of Variety.	Trees Living in Fall of 1890.	Trees Living in Fall of 1891.	Present Condition.	Season's Growth.
Bradshaw	2	2	Growing from roots	30 inches from roots.
Coe's Golden Drop	1	1	do do	34 do do
De Soto	2	2	Good	18 inches.
Early Red	7	7	do	16 do
Late Red	2	1	Growing from roots	Small.
Marianna	2	2	do do	4¼ inches from roots.
Moore's Arctic	2	1	do do	18 inches.
Nicholas	3	3	do do	40 do
Otschakoff	2	2	Good	Fair.
Yellow Gage	1	0		
Trabische	1	1	Growing from roots	Small.
Native Wild Plum	7	7	Good	Good.

PEAR TREES.

Of 27 pear trees planted in 1889, 4 trees of the Russian varieties are still living, and, although making a slow growth, appear to be hardy. With the exception of a few trees which are growing from the roots, all other varieties have been winter-killed.

Fifty seedlings raised from seed imported from Russia were planted in rows in the spring of 1890. Of these 30 are living and making good growth, and at present are very promising.

Name of Variety.	Trees Living. 1890.	Trees Living. 1891.	Present Condition.	Season's Growth.
Bessemianka	1	1	Good	14 inches; hardy.
Clapp's Favorite	2	1	Poor	Small; kills back.
Flemish Beauty	2	1	do	do do
Howell	1	0		
Gakovsk	1	1	Good	10 inches; hardy.
Kurskaya	3	2	do	16 do do
Pomeranovka	1	0		
Sapieganka	1	0		
Seckel	2	1	Poor	Small.
Thin Twig	1	0		
Russian Seedling	30	30	Promising	12 inches; hardy.

RASPBERRIES AND BLACKBERRIES.

In the fall of 1890 a portion of the canes of each variety then living were covered with earth or manure as a protection against the winter, while the remainder were left unprotected. In April, 1891, they were uncovered, and it was found that, owing to the warmth of the soil, those covered were in an advanced stage of growth, and suffered more from the cold weather which followed than those unprotected. In the case of the red raspberries no difference was observable during the summer between the protected or unprotected, but with the Black-cap varieties there was a marked difference in favour of protection.

The following varieties are doing well, and have fruited during the past season:—

Philadelphia (red), "from plants procured in the province," is very hardy, and does well without protection, is a good bearer, and very early; fruit ripening with us from July to September.

Turner (red), is also very hardy; fruiting on both old and young canes; fruit ripened from early in August to end of September.

Hilborn (Black-cap), although very hardy, is the better for a little winter protection; bears well; fruit ripening during August and September.

The Marlboro', Cuthbert, Reider, Heebner, Golden Queen and Caroline, in the red and yellow varieties; Gregg, Black-cap and Snyder, Wachusett's, Thornless and Agawam blackberries grew well, and fruited with us during the past season, but having only a few plants of each variety, we cannot yet speak with certainty as to their hardiness.

STRAWBERRIES.

The strawberries planted in 1889, in a sheltered plot on the hill-side, came through the winter in good shape, and during the past season yielded a fair crop of fruit. The Crescent variety again fruited well, and commenced to ripen the first week in July, followed closely by Captain Jack and Wilson. Bubach and Manchester with lighter yields ripened in the middle of July. Sharpless and Daniel Boone fruited very heavily, but being later, only ripened a part of their fruit.

In May a new plot was planted with runners from the old bed, and in August the old bed was thinned out, and allowed to make runners for another season.

GOOSEBERRIES.

With the exception of one variety, the "Houghton," all of the gooseberry bushes suffered severely from the effects of the trying weather experienced last spring. Coming safely through the winter, the warm weather of April brought them rapidly into leaf, and being very tender, when sharp frosts and winds occurred in May a great many were killed, and those surviving lost their blossom and were badly frozen back. During the past season they have grown again very rapidly, the result being that the new wood is weak and straggling, lying on the ground instead of growing into bush shape. Tests of different modes of training and pruning are being made in the endeavour to overcome this straggling habit.

Name of Variety.	Plants Living.		Remarks.
	1890.	1891.	
Houghton	156	143	Hardy; appears to be the best for this province.
Downing	133	10	Doubtful.
Smith's Improved	65	22	do
Native	31	31	Useful, but requires training; fruit small.

CURRANTS.

Although the currant bushes suffered from the spring weather in the same manner as the gooseberries, they were not injured so badly, scarcely any being killed. The effect on their growth during the season has, however, been precisely the same; the young shoots and blossoms were destroyed, and much of this season's growth has been lost, it being necessary to cut away all straggling shoots.

Name of Variety.	Plants Living. 1890.	Plants Living. 1891.	Remarks.
Black Currants, Lee's Prolific	426	426	Perfectly hardy.
do Blk. Champion	10	10	do
do Blk. Naples	100	100	do
Red Currants, Fay's Prolific	24	16	Hardy; lost from effects of roots washing bare.
do Raby Castle	202	202	do
do Red Cherry	140	140	do
do Red Grape	10	6	do
do Victoria	13	9	Doubtful.
White Currant, White Grape	170	170	Hardy.
Native Black	39	39	Bears well, but fruit does not ripen evenly.
Native Red	11	9	Tests not satisfactory.

GRAPE VINES.

In my last report mention was made of the planting in a well-sheltered plot during 1890 of 100 grape vines; although all were living in the fall and were very carefully covered before severe weather, none survived the winter.

We have now tested most of the hardy varieties of cultivated grapes, and experiments are being undertaken with the native grape found growing wild in many parts of the province.

FRUIT TREES PLANTED IN 1891.

In May last a fresh collection of trees were received from the Central Experimental Farm at Ottawa. This collection consisted of 103 trees of large fruits and 318 plants of small fruits. These were planted in rows, and were all living when winter set in. They will be reported on after they have passed the ordeal of a winter here.

FOREST TREES AND SHRUBS.

As considerable interest is taken in this branch of the farm work, it is thought advisable to give results of another year's testing, so as to show the growth and hardiness of the different varieties of trees and shrubs.

It will be observed that a large percentage of trees have been lost, but these should not be charged altogether to the climate, as many of those lost are of varieties which although desirable to test were never expected to be hardy so far north.

Again, as most of our trees came from distant points and were a long time in transit, a number have been lost from the effect of heating, etc. It is also noticeable that a very large percentage of loss has been incurred with seedling trees. This tends to show that young seedlings of some varieties of trees are at too tender a stage of their growth to bear transplanting in this climate. The greatest success appears to have been obtained so far with trees of from two to four years' growth.

It will be seen from examination of the following tables that with careful selection and planting, followed by judicious cultivation, it is possible to grow in the pro-

vince a large variety of trees and shrubs. Some trees are especially worthy of notice for hardiness, as the native ash-leaf maple, native ash, oak and white elm, the Russian poplars and willows, cottonwoods, Russian olive, mountain ash, alder, Caragana, Scotch pine and white spruce; whilst for quick growth and length of season in leaf the Russian poplars and willows and birch of all varieties are very noticeable. On this farm we have the Petrovsky poplar 8½ feet high from cuttings planted in 1889, and the Voronesh willow 7½ feet high from cuttings planted in 1890. Some small birch planted in 1889 are now 7 feet high and have made a bushy growth 6 feet across.

A number of trees were planted in the spring of 1890, in gravelly and light soil, on the exposed prairie at the north end of the farm; of these, only 8 per cent have died. The trees doing best in this soil are cottonwoods, Russian poplar, Voronesh willow, Russian olive and native maple and elm. It will be seen by this that the above trees will succeed on all classes of soil in this province.

FOREST Trees planted in 1889 and 1890, with number living in Fall of 1891.

—	Planted.	Living.	Planted.	Living.	Present Height.	Season's Growth.	Remarks.
	1889.	1891.	1890.	1891.	Inch.	Inch.	
Ash, white	....	....	2,886	....	36	28	Hardy.
do do seedlings	250	....		....	....	....	Too young to transplant.
do pubescens or red	....	....	500	363	38	26	Half hardy.
do do seedlings	349	39	....	....	....	....	Too young to transplant.
do Acuminata	....	....	61	4	44	16	Hardy.
do green	285	156	2,000	1,911	26	24	Kills back.
do black	....	....	134	15	....	....	
do European mountain	51	26	31	11	68	14	Half hardy.
do American do	22	16	111	104	76	18	Very hardy.
Alder, European	50	30	100	....	36	20	Hardy.
do white	10	4	100	18	50	28	do
Arbor Vitæ or Cedar	1,066	362	68	5	24	10	Doubtful.
Birch, yellow	105	89	....	....	78	34	Hardy.
do white	50	48	42	16	84	39	do
do canoe	40	28	....	....	....	....	do
do sweet	10	6	....	....	....	....	do
Coffee tree, Kentucky	....	....	250	38	....	....	Kills back.
Cherry, black	153	4	....	....	....	....	Not hardy.
Chestnuts, sweet and Spanish	...	....	50	....	....	....	
Black walnut	....	....	1,000	....	....	....	Too tender.
Butternut	....	....	900	356	20	10	
Black locust	....	....	500	80	....	....	Too tender.
Elm, American	1,082	361	5,389	5,021	62	34	Half hardy; kills back.
do from native seed	1,087	954	....	....	75	34	Hardy.
Hemlock	42	....	....	....	....	....	
Honey locust	....	....	500	....	....	....	
Hickory	....	....	15	....	....	....	
Oak, burr	100	5	100	62	...	Small...	Hardy.
Larch, European and American	522	20	138	....	....	....	Received too late in spring.
Linden seedlings	....	....	500	31	....	Small...	Too young to transplant.
Maple, ash-leaf, native	503	500	175	175	65	47	The native maple.
do Norway	536	68	110	85	56	28	Only half hardy.
do soft, A dasycarpun	76	29	2,000	1,443	50	38	Half hardy.
Pine, Scotch	258	37	175	129	24	10	Hardy.
do Austrian	439	....	120	....	....	....	
do Riga	67	16	500	30	....	....	Too young to transplant.
do mountain	....	....	150	....	....	....	do
Red cedar	....	....	100	7	....	....	do
Russian olive	....	....	100	76	50	26	Ornamental and hardy.
Russian mulberry	....	....	1,050	143	....	....	Kills back; doubtful.
Cottonwood	308	291	1,000	272	100	40	Northern grown; hardy and useful; southern, tender.

FOREST TREES—*Continued.*

—	Planted.	Living.	Planted.	Living.	Present Height.	Season's Growth.	Remarks.
	1889.	1890.	1890.	1891.	Inch.	Inch.	
Spruce, Norway.	532	00	378	126	......	....	Not hardy.
do white	65	25	75	62	21	10	Hardy.
do blue	....	......	10	00	......	....	
Russian poplars	8	8	......	......	110	45	Hardy ; useful and ornamental.
do Pyramidalis	1	1	......	......	......	....	Not hardy.
do certinensis	5	4	......	......	102	44	Hardy ; useful and ornamental.
do Petrovsky	36	36	......	......	100	33	do do
do bereolensis	11	9	......	......	91	28	do do
do Wobstii Riga	2	2	......	......	......	....	Hardy and very early in the spring.
do Siberica	2	2	......	......	92	46	
do Aurea	3	3	......	......	......	....	Not hardy.
do Alba Argenta.	2	2	10	10	50	34	A hardy white-leaved variety.
do bolleana	2	2	.....	......	58	42	Hardy and ornamental.
Russian Willow, Voronesh	5	5	.....	......	94	53	do wood, a golden colour, useful for trees.
do Acutifolia	3	3	.....	......	91	35	Hardy, quick-growing.
do basket	7	7	2	2	100	95	do useful for hedge.
do Wisconsin weeping	8	8	......	......	96	72	Not hardy.
do Brityensis	3	2	......	......	......	Small...	do
do Fragilis	4	2	.....	......	......	do ..	do
do yellow	7	7	......	......	69	39	Hardy ; ornamental for hedge.
do white	7	7	......	......	66	37	Hardy.
do Norway and purple	8	8	......	......	92	63	do
Symphoricarpus, snow berry	......	......	3	2	.....	....	A native shrub.
Viburnum opulus, snow ball	......	......	3	3	27	10	Hardy.
do lantana	......	.....	4	4	......	....	do
Weigelia lavallei	......	......	3	2	.....	....	Half hardy.
Amelanchier, Canadensis	......	......	2	2	.....	....	
do Alpinum	......	......	2	1	.....	....	
Spirea opulifolia	60	16	50	44	38	30	Hardy hedge plant.
do douglasii	6	1	......	......	......	....	Hardy.
do van Houtte	6	2	......	......	......	....	do
do prunifolia	2	0	......	......	......	....	
do bullata	2	0	25	5	......	....	Hardy flowering plant.
do billardi	6	6	.....	.....	......	....	Hardy.
do callosa	3	1	......	......	.....	....	
do californica	7	0	......	......	.....	....	
do nobleana	2	2	......	......	.....	....	
do Superba	.....	......	10	4	......	....	
do hypericifolia	......	......	2	2	......	....	Hardy ; of weeping habit.
CLIMBERS	.....	......	......	......	....	....	
Lycium Europeum	1	1	.....	......	......	84	Hardy.
Clematis Flammula	7	3	......	......	.....	75	do
Rosa Rugosa	1	1	......	.....	22	14	do upright form.

Shrubs and Ornamental Trees Planted in 1889 and 1890, with Number Living in Fall of 1891.

—	Planted, 1889.	Living, 1891.	Planted, 1890.	Living, 1891.	Present Height.	Season's Growth.	Remarks.
Birch, cut-leaf weeping	3	2	.. ..	......	11½ feet.	29 inch..	A valuable ornamental tree.
Asiatic maple (Acer ginnala).	2	2	.....	.....	36 inch..	10 " ..	A hardy ornamental shrub.
Caragana	44	24	105	94	50 " ..	17 " ..	Very hardy and early.
Lilacs, vulgaris....	4	4	10	10	32 " ..	11 " ..	
do alba..	77	65	8	7	31 " ..	18 " ..	
do josikea.	1	1	.	......	....	Small. .	Hardy.
do de marley..........	4	3	17	17	28 inch..	8 inch..	
do purpurea.	2	1	....	......	......	......	
do rothamagensis	2	2	....	......	....	....	
Laurel-leaved willow.	2	2	......	......	42 inch..	34 inch..	Hardy and ornamental.
Pyrus baccata aurantiaca...	1	1	.....	......	36 " ..	22 " ..	do
Cornus Siberica..	1	1	.....	......	42 " ..	38 " ..	do do
Artemisia (southernwood) ..	4	4	25	23	60 " ..	60 " ..	Hardy, early and quick growth.
Berberis, vulgaris..	150	98	50	36	24 " ..	14 " ..	Useful for low hedge.
do elegans	12	.....	.....	.. ..	....	... .	
do purpurea.........	.....	.....	30	13	....	....	Purple leaves, ornamental.
Flowering currants.........	3	3	7	6	32 inch..	20 inch..	Hardy.
Cytisus capitatis.....	10	6	......	.....	36 " ..	34 " ..	A hardy flowering shrub.
Deutzia candidissima......	......	.....	7	3	....	....	Half hardy.

A LIST OF HARDY, HALF HARDY AND TENDER TREES.

As many enquiries are received from persons contemplating tree-planting, regarding different trees and shrubs, it is thought advisable to give a classified list, so as to show as near as can be given with present experience the relative hardiness of the trees and shrubs under trial here since 1889.

Hardy and Safe to Plant.	Half Hardy, of which a Percentage Live, but are Liable to Kill back.	Trees which Appear to be too Tender for Planting in this Province.
Ash, native, white and green.	Ash, red and black.	Black cherry.
American mountain ash.	European mountain ash.	Catalpa.
Alder (white) oak (native).	Alder (European), larch (European).	Hemlock.
Birch (all varieties) Scotch pine.	Arbor vitæ or white cedar.	Austrian pine.
Cottonwoods (northern grown).	American elm (imported).	Honey locust.
Native ash-leaf maple and white elm.	Norway and soft maples.	Black do
Russian poplars, Bereolensis, certinensis.	Cottonwoods (southern-grown).	Black walnut.
———, Petrovsky, Sibirica, silver leaf.	Russian poplars, aurea.	Rock elm.
Spruce, native, white.	Lindleyana, pyramidalis, bolleana.	Russian mulberry.
Russian willows.	Spruce, white (imported).	Sycamore.
Asiatic maple (dwarf), Acer ginnala.	Wisconsin weeping willow.	Beech.
Caragana.	Kentucky coffee tree.	Black locust.
Yellow flowering currant.	Norway spruce.	
Lilacs, barberry.		
Russian olive.		

A large quantity of native tree seeds were collected, and a part of them sown in the fall of 1890. Seeds of the native maple and ash germinated early in spring, but the seedlings were all killed by the spring frosts and cold winds.

As the same result was also experienced with maple and ash seed sown in the fall of 1888, it is evidently not advisable to sow these seeds in the fall or too early in the spring.

A quantity of oak nuts and other native tree seeds sown at the same time did not germinate till late in the spring, and a large number of seedlings from these were living when winter set in, but were too small to allow of an exact account being taken.

In May of this year another lot of maple seed was sown in rows 3 feet apart, and covered lightly with the plough; these germinated at once, with the result, that about 50,000 seedlings have been obtained from this sowing.

Seeing the hardiness of the native trees, and realizing the importance of securing a large supply for the purpose of wind-breaks and for distribution, a large number of elm and other seedlings were procured in the fall of 1890, and of these 13,000 were sent to the Experimental Farm at Ottawa and Indian Head, and 5,000 were distributed amongst farmers in different parts of the province, in answer to applications from them.

In the spring of 1891 a further supply of seedlings of birch, spruce, etc., was secured from the bush near here, and, with the remainder of those gathered in the fall of 1890, were planted out in nursery rows. In addition to these, the most hardy and desirable of the Russian poplars and willows have been propagated so as to yield a large supply of cuttings, which, together with the native seedlings mentioned above, will form a stock available for planting and distribution during the coming season.

The following is a list of the tree seedlings raised from seed and otherwise procured during the past year:—

Maple, ash-leaf (native), grown from seed	51,955
Elm, white (native), transplanted from bush near river	9,773
Birch (native), transplanted from natural bush	2,100
Spruce (native) do do in sandhills	127
do seedlings (native), transplanted from natural bush in sandhills	569
Tamarack (native), transplanted from swamp	39
Buffalo berry, transplanted from river flats	128
do (seedlings), grown from seed	400
Cherry (Choke), transplanted from bush	11
do ground or sandhill, transplanted from sandhills	27
Oak, grown from seed (about)	2,000
Virginia creeper or American ivy, transplanted from bush at Oak Lake	150
Russian willows, grown from cuttings	469
Caragana, grown from seed	2,000
Furze, Scotch do	100
Small fruits bushes from cuttings	100

Total number of trees, seedlings, etc., growing on the Experimental Farm in the fall of 1891, or grown from seed planted in—

——	1889.	1890.	1891.	Total.
Forest trees and shrubs	3,481	13,417	1,791	18,689
Native trees and seedlings	4,073	14,731	69,950	88,754
Avenue trees				919
Large fruits, apples, etc	343	574	74	991
Small fruits				1,963
				111,316

HEDGES FOR WIND-BREAKS.

In 1889 a hedge of ash-leaf maple was planted near the western boundary of the farm; this has now reached a height of 7 feet, and is found very useful in protecting more tender trees, shrubs, &c., from our severe south-west winds.

To thoroughly test the suitability of the different varieties of trees for this purpose, and to ascertain the proper distance to plant them, ten plots have under your directions been laid out, and several varieties of trees planted at varying distances around each plot. By this means it is expected that some light may be thrown on the question of suitable wind-breaks for this country.

AVENUE TREES.

The planting of avenue trees on the roads as far as made was completed this year by the setting out of 59 ash-leaf maples on the main avenue. I have pleasure in reporting that only one out of the 919 ash-leaf maple avenue trees planted on the farm died during the past year; all are in perfect health, and making a large growth each year.

As many enquires are made as to the proper manner of setting out large trees for avenue purposes, the method which has been adopted here will be given. Trees about six years old and 8 feet high were purchased from the nurseries near Brandon, but dug by our own men, so as to get as much root as possible, care being taken to protect the roots from wind and sun until planted. In planting, a hole a foot deeper than is actually required and somewhat larger than the roots require is dug; the bottom foot of the holes is then filled with surface soil, the tree planted and surface soil packed around the roots. Unless the season is unusually dry no water is used, but all weeds are kept down for 4 feet on each side of the trees. If the above method is adopted the loss should not in an ordinary season exceed 3 per cent.

FREE DISTRIBUTION.

Last winter a large number of applications for trees were received from farmers throughout the province.

In early spring over 20,500 trees and tree-cuttings were distributed by mail. They were sent in packages containing 100 trees, as follows :—

Variety.	Number.	Variety.	Number.
White elm, native	10 trees.	Artemesia Abrotans	5 cuttings.
Buffalo berry, native	2 do	Populus Pyramidalis	1 do
Ash-leaf maple do	10 do	do Petrovsky	1 do
Green ash do	10 do	do Lindleyana	1 do
White spruce do	10 do	Salix, 122 vor	7 do
Poplar Siberica	1 cutting.	Willows, Wisconsin weeping	7 do
do Nolesti	1 do	do Norway	7 do
do Beno	3 do	do Purple	1 do
do Certinensis	2 do	do Basket	1 do
do Bereolinsis	1 do	do Golden	1 do
do Wobstii Riga	1 do	do Yellow	1 do
do Alba Argenta	1 do	do Acutifolia	2 do
do Aurea	1 do	do Voronesh	5 do
do Bolleana	1 do	Northern cottonwood	6 do

EXPERIMENTS WITH VARIETIES OF CABBAGE.

As no test of the relative merits of the different varieties of cabbage for this climate had been published, it was thought advisable to test a number of the leading sorts. The seed of twenty-eight varieties was obtained last winter and sown in a hot-bed in early spring. The season here was very unfavourable for this vegetable and the returns small, but all were treated alike, and the experiment as a comparison of varieties may be considered fairly reliable.

EXPERIMENTS WITH CABBAGE.

Variety.	When ready for use.	Per-centage headed.	Average weight.	Remarks.
		Per cent.	Lbs.	
Marblehead Mammoth (Steele)	Sept.	90	14	Large; firm.
do (Robinson)	do	90	13	do
Trotter's Early Drumhead	Aug. 20	100	13	Very good; firm.
Henderson Early Summer	do 5	100	12	Firm head.
Vandergaw	Sept.	90	12	Open head.
Late Drumhead	do	100	11½	Firm head.
Hendersons' Succession	Aug. 7	100	11	do
Quintal Drumhead	Sept.	100	9½	Open head.
Large Flat Dutch	do	90	9½	Firm head.
St. Denis	do	100	9	Open head.
Premium Flat Dutch	Aug. 10	100	9	Firm head.
Early Jersey Wakefield	do 1	90	9	do
All seasons	do 15	90	9	do
Filderkraut	Sept.	60	6	Open head.
Early Winningstadt	Aug. 5	70	6	Firm head.
Savoy Drumhead	Sept.	60	6	do
Early Sugar	Aug. 20	60	5	Open head.
Early Etamps	July 26	90	5	Head soft.
Early Deep Red	Sept. 10	60	5	Firm.
Early Oxheart	July 26	90	4½	Firm head.
Large Red Drumhead	Sept.	90	4½	Soft head.
Savoy Improved American	do	90	4½	Open head.
Savoy Green Globe	do	50	4½	Firm head.
Savoy Early Dwarf Ulmn	Aug. 10	90	3	do
Early York	July 26	100	3	do
Savoy Early Dwarf	Aug. 25	90	3	do
Scotch Kale			4	Good quality.
Brussels Sprouts			2 sprouts.	Open.

GARDEN PEASE.

Results of tests with garden varieties of pease. All varieties were sown on the same day, 8th April, side by side, in single rows, 3 feet apart; all had germinated and were growing by 20th April. No trellis or sticks were used:—

Varieties.	Ready for Use.	Length of Straw.	Pods.	Remarks.
Kentish Invicta	July 13	Short.	Medium length and full	Yielded well.
Blue Peter	do 13	20 inches	Medium length and full	Yield heavy.
Extra Early	do 16	24 do	Medium	Yield fair.
Little Gem	do 16	Short.	Short and full	do
Stratagem	do 20	24 inches	Large and full	Good yield.
Pride of the Market	do 20	20 do	do	Heavy yield.
Horsford's Market Garden	do 21	20 do	Medium length	Good yield.
Yorkshire Hero	do 22	24 do	do	do
Mummy Pea	do 22	4 feet	Medium length and full	Very heavy yield; ripened 20th Aug.; made very strong growth during spring season.
Telephone	do 24	3 do	Large pods but not well filled	Good yield.
Champion of England	do 28	33 inches	Large pods	do
Emperor	do 28	30 do	Large and full	do
Laxton's Omega	Aug. 1	24 do	Long do	Good yield; an excellent late variety, keeping green and sweet.
Grey Pease	Late	Long	Did not form	A novelty, but of no value here.

FLOWERS.

As very great interest has been taken by the majority of visitors in the cultivation of flowers, considerable attention has been given to the growth of hardy and popular flowering plants and bulbs, with the object of showing what plants and varieties are best adapted for successful cultivation in this province.

The result has been that from 24th April, when the first flower appeared until winter set in, some variety or other of plant or bulb was in flower the whole season, and during the months of August and September produced such a mass of bloom as to be a great source of attraction to visitors to the farm.

In the fall of 1890 a number of bulbs were procured and planted 4 inches deep, and the ground covered during the winter with about 6 inches of short manure.

The bulbs planted and the results were as follows:—

Scilla Amœna.—Flowered 24th April and continued in flower two weeks.

Bulbocodium vernum.—Flowered 6th May to 20th May.

Tulips (single and double).—Flowered from 14th May to 10th June.

Lilium candidum.—Flowered from 15th July to 4th August.

Lilium tigrinum.—Flowered from 28th August to 8th September.

Iris Hispanica.—A few bulbs only; flowered during August.

Gladiolus Lemonei.—Planted 11th April; flowered 8th August.

Gladiolus gadavensis.—Planted 20th April; flowered 28th August to 15th September.

Paeonia Sinensis.—Grew well, but did not flower this season.

The following bulbs all started to grow, but gradually died off and did not flower: *Hyacinth*, single and double; *Colchicum autumnale*, *Crocus*, *Galanthus* or snowdrops, *Narcissus*, *Hemerocallis.*

The following plants are mentioned in the order in which they bloomed; those marked perennials were planted the previous summer, and had survived the winter out in the open.

Pansies (perennial).—A mass of bloom from 13th May till winter set in.

Linum perenne, or Flowering Flax.—Bloom from 15th May till winter set in.

Candytuft.—In flower from 19th June till winter set in.

Linaria Safferina.—In flower from 24th June till winter set in.

Sweet William (*Dianthus barbatus*) (perennial).—In flower 21st June; very showy.

Dianthus Imperialis (perennial).—In flower 24th June; a mass of bloom.

Dianthus Heddewigi do do 21st do do

Portulaca, Mimulus Callirrhoe and *Calliopsis.*—All came into flower in July.

Larkspur (*Delphimum*).—In flower 1st August; very showy.

Clarkia.—In flower 4th August till frost came.

Verbenas.—In flower 28th July till 25th October; very hardy.

Phlox Drummondi.—In flower 1st August to 15th October; very hardy and showy.

Petunias.—In flower 1st August to 20th September; very showy.

Marigolds.—In flower 6th August to 15th September; very showy but tender.

Stocks.—In flower July and August.

Antirrhinum (*snap dragon*).—In flower August and September; showy and hardy.

Chrysanthemum carinatum.—In flower August and September; succumbs to first frost.

Lobelia.—In flower July, August and September.

Double Daisy.—In flower do

Sweet Pease do do

Escholtzia's, white and yellow.—In flower August and September.

Aster's.—In flower 10th August to 30th September.

Salpiglosis.—In flower 16th August to 30th September; very showy.
Zinnia do 4th do very showy, but tender.
Balsams do 18th do do
Godetia do 20th July to August; very showy, but tender
Mignonette do July to September.
Lupins.—Blooms very late; plants showy.
Gilia, Cosmos, Aguilegia and *Wallflower.*—Plants grew well, but did not bloom.

ROADS.

I take great pleasure in reporting that the grading and gravelling done in 1889 on the road running from east to west through the farm has proved a success, the very heavy traffic of the past year having no perceptible effect on it.

About 800 yards of additional grading and gravelling has been done during the past year on the avenues running north and south, and a number of culverts put in.

BUILDINGS.

The superintendent's house, mentioned in my last year's report as being finished, is now occupied, and the vacated building used as a boarding house for the employees on the farm. The new house is quite warm, and having an office attached is very convenient.

The horse and cattle stables in the basement of the barn are also warm and well adapted to the purposes intended. The upper portion of the barn is nearly all occupied with grain, leaving very little room for fodder, &c. A separate building for grain and implements is greatly needed.

EXHIBITIONS.

During the year just passed the following agricultural fairs were attended and samples of the products of the farm shown:—

Brandon summer fair was held on the 22nd and 23rd of July. This fair was a decided success, the weather being fine and the attendance large. Coming early in the season, only immature grain in the sheaf and threshed grain of the previous year could be shown, but opportunity was taken to make a large display of horticultural and arboricultural products of the farm, something impossible at the fall fairs. During the two days of this fair over 400 farmers visited the experimental farm.

At the Winnipeg industrial exhibition, held in Winnipeg in the week ending 3rd October, Mr. Angus Mackay, of the North-West Territory experimental farm, joined me in making a united exhibition of the products of the two farms. The exhibition was largely attended, and we were able to illustrate the work of the farms to a large number of people who would not have been easily reached by any other means.

Exhibits were also shown at Portage la Prairie and Neepawa fall fairs; at both places large numbers of farmers expressed an interest in the work of the farms.

SAMPLES OF EXHIBITS FOR THE EAST.

Besides the samples of farm products used at the several agricultural fairs in this province, a set of samples in the straw was sent to the Central Experimental Farm for exhibiting at some of the eastern fairs.

The Manitoba Government was also supplied with collections for the following purposes: one collection for exhibition purposes at Toronto and other eastern fairs; one for England, and another for their Winnipeg immigration office.

The work in connection with the preparation of these samples occupied the time of a portion of our staff during the busiest season of the year, but they will help to draw attention to the work of the farms, and will, I trust, also be useful in attracting immigrants to this province.

FARMERS' INSTITUTES.

A large number of invitations to attend meetings have been received by me from institutes throughout the province. It was found impossible, owing to press of work, to accept all of them, but the following meetings were attended and papers read: Wawanesa Institute, 6th February, "Some of the experiments undertaken by the Experimental Farms"; Wawanesa Institute, 20th February, "Varieties of Grain and manner of sowing them"; Brandon Institute, 23rd February, "Smut"; Bradwardine Institute, "Varieties of Wheats suitable for Manitoba"; Birtle Institute, "Some of the varieties of Grain tested on the Experimental Farms"; Alexander Institute, "Seed Grain and manner of sowing it"; Rapid City Institute, "Wheats for Manitoba"; Brandon Institute, "Fodder Plants for Manitoba"; Crystal City Institute, 30th June, "Grasses and Fodder Plants"; Brandon Institute, "Seed Grain." In many cases samples of grain, both threshed and in the straw, were shown at the meetings, which assisted materially in illustrating the work of the farm.

VISITORS TO THE FARM.

Judging by the largely increased number of visitors, the interest taken by the farmers of the province in the work of the experimental farm is in nowise abating. During the summer months of 1889 only 560 visited the farm; in 1890 the number reached 1,510, and in the same months this year 3,520; this is exclusive of the large number of Brandon citizens, many of whom visit it several times a week.

During the past year a number of the farmers' institutes organized excursions for the special purpose of examining the work on the farm, and over one hundred farmers from Portage la Prairie alone visited it at one time.

Every effort is made by the farm staff to explain the work being undertaken and to make all visitors welcome, and perhaps a better idea of the usefulness of the farm can be given by this means than by any other which could be devised.

The North-West Central Railway is now in operation from this place, and farmers living in the fine farming district to the north-west will have an opportunity of visiting the farm another year.

CORRESPONDENCE.

Not only has the number of visitors to the farm increased surprisingly, but the correspondence has also grown rapidly; from 467 letters received in 1889, and 842 in 1890, the number increased to 1,423 in the past year, and 1,468 letters were sent from the farm.

The building and equipping of an office on the farm has greatly assisted the carrying on of this department of the work.

I have the honour to be, Sir,

Your obedient servant,

S. A. BEDFORD,

Superintendent.

BRANDON, MAN., 26th January, 1892.

EXPERIMENTAL FARM FOR THE NORTH-WEST TERRITORIES.

REPORT OF A. MACKAY, SUPERINTENDENT.

INDIAN HEAD, N.-W. T., 31st December, 1891.

WM. SAUNDERS, Esq.,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit to you herewith my fourth annual report of the work done on the North-West experimental farm, being for the year 1891. The year just passed, like all its predecessors, has been exceptional. While some years have been dry, others dry and warm, this has been wet, cold and backward. The growth of straw over the whole country has been enormous; grain also has yielded very largely, and although a portion was partially injured by frost on the 12th September the quantity secured by every settler has never before been approached in the history of the North-West. Forty to fifty bushels of wheat and eighty to one hundred bushels of oats per acre are common returns, while in many instances these figures are exceeded.

Rains in June and July caused an immense growth of straw. The cool weather in August retarded the ripening process and the harvest consequently was later than usual. The crop was a very tedious one to take off, and the threshing is proving very expensive from the great amount of work to do. On the experimental farm, the result in grain-growing has not been as satisfactory as could be desired; heavy winds and a severe frost in the first week in May, after most of the early-sown grain was up, entirely destroyed a good many varieties of barley and oats and greatly injured many of the wheats, by thinning them to such an extent that ripening was delayed until frost came in September. Grain on summer fallow also was very late in ripening, on account of the large amount of moisture and cool weather during the growing season, and though all varieties not entirely destroyed returned good yields, except the Indian wheats, yet with many the sample is very poor.

For roots and vegetables the season has been favourable, though hardly long enough to secure a full crop of all kinds.

For tree culture last winter and spring were anything but favourable, but since May no season has ever caused such a good, healthy growth in young trees as the past one. While the large growth is often injurious and apt to cause their destruction by our winter cold or spring thaws and winds, it is hoped on account of many of the varieties ripening their wood well, the loss this winter will be less than usual. The winter of 1890-91 was especially fatal to almost everything in the tree line; even many of our native sorts, such as maple, ash, elm, &c., were badly cut back in seedlings and two-year-old trees, while foreign varieties, if not entirely killed, were cut back to the ground wholesale.

Special attention was given to fodder and grass cultivation during the past season, and although many failures ensued some successes have been obtained. Winds in many instances destroyed varieties of grass and a few mixtures sown for fodder, but many pulled through and gave gratifying returns.

In growing mixtures of grain for hay four important points require to be observed: 1st. To sow sufficiently thick to ensure the stalks not being too coarse. 2nd. To sow varieties together that head out or ripen at about the same time. 3rd. To cut early; and 4th. To allow plenty of time after being cut to properly cure. Two good mixtures are rye and 6-rowed barley, and 2-rowed barley and oats.

A fodder plant that has never failed on this experimental farm is rape. This year it exceeded all previous records. It must of course be used in a green state, either by pasturing or cut and fed green.

In Grain—Wheat was given a large acreage and more attention than any other cereal. Thirty-seven varieties were sown in plots or fields from $\frac{1}{10}$ acre up to 30 acres. Nine hybrids, besides 16 other varieties, were sown in small plots. Various experiments were made, including the sowing of two varieties each week for six weeks; sowing several sorts on same date under same conditions; sowing different quantities per acre; sowing at different depths; sowing by Press drill and broadcast; sowing several grades of frozen seed; different treatment for smut, &c. While some of these tests for various reasons were unsatisfactory, the attention of every settler is called to the result obtained from treating smutty seed with bluestone before sowing. I am told by a grain buyer that every 3rd bushel he buys is damaged by smut, and that to such an extent that while he pays 40 to 50 cents for frozen grain, this smutty wheat realizes to the grower only 30 to 35 cents. When it is considered that at a cost of a few cents per bushel seed can be successfully treated for this serious evil, it is reasonable to expect that no farmer will sow wheat next spring without being treated with bluestone. The season was favourable for poor seed, and the result of sowing frozen seed, as shown in test, should not be an inducement for settlers to sow their poor worthless grain. The good showing was caused by sufficient grains germinating in the favourable spring to cause the crop to be thick enough, but not to lodge, while in the better grades so much germinated that the crop was altogether too heavy, resulting in lodged straw and shrunken grain.

Ladoga wheat again this year proved early, although badly injured in May by winds. It was ripe, and cut ten days before Red Fife, and escaped all damage by frost, which the bulk of our Red Fife did not.

Two promising wheats were tried the past season: Campbell's White Chaff and Campbell's Triumph. The former, a soft variety, but much harder than last year, promised well during the entire season. The latter, a hard variety, though not so promising in the early stages as the White Chaff and some other varieties, gave the finest sample of grain on the farm.

The India wheats without an exception did poorly the past season. The winds and frosts in May had a far more injurious effect on them than on the Red Fife, and although sown on same date and everything in same condition, the India sorts had from one-third to one-half the young plants killed; the Red Fife had none.

The barley crop was greatly injured by winds in May. All sown prior to the 15th April was killed. That sown from 25th April to the 11th of May did best. Many of the wheat tests were repeated with barley. The Duck-bill variety proved, as in previous years, its adaptability for the North-West. It stands severe weather in spring, all sorts of weather in the growing months—June, July and August—and invariably gives the best yield when threshed. A variety called California Prolific, tried the past season for the first time on the experimental farm, proved very good. Straw heads and grain all point to this variety being the same as Duck-bill.

Oats suffered even more by winds and frost in May than the barley crop. Many varieties covering about fifty acres had to be re-sown with Feed oats. These gave a fine crop but were hurt by frost before being quite ripe. Prize Cluster though not first in yield is first in earliness and a first class oat, and is proving very successful wherever distributed in the North-West.

Pease were a very poor crop; while our field lots were entirely killed, the smaller plots were injured by winds and heavy dashes of rain flooding out portions of the plots.

In respect to these winds which injure us so greatly on the experimental farm, and which from reading this report may convey very erroneous impressions to any one not knowing the country, it may be said that the damage done to the generality of farmers is very small in comparison to that done on the experimental farm. On this farm nearly all sorts of grain are sown for trial on fallow very early in

the spring. Farmers only sow Red Fife, and it has been proven that Red Fife will stand sowing almost at any time. Again, three-fourths of the varieties of grain tested on the experimental farm are new or foreign sorts that cannot be expected to stand as well as Red Fife, the one variety almost universally sown all over the country. It is safe to say that if Red Fife, White Fife or any other proved variety was alone used on the Experimental Farm a very small proportion only of this injury would be done. Again, take oats. A farmer sows his oats in almost every case on stubble land which never is injured by wind, no matter how severe. On this farm we cannot use stubble land for any kind of grain and keep the sorts pure or give fair results from such a test, as the returns from such land would contain at least a portion of the preceding crop, as it is well known that fallen grain remains perfectly good until turned under the following spring, when it readily germinates. Other reasons might be given why the wind storms in spring are more injurious to crops on the experimental farm than to the country at large, and while it is not asserted that the farmer receives no damage, those who may read this report are asked to consider the wonderful crops raised in the North-West the past year, and in that year was experienced the most severe wind storms known for years.

SMUDGES.

For some years past smudges as a means of preventing grain being injured by frost have been believed in by many; others have found them ineffectual. To as thoroughly test this matter as it was possible to do, a circular flower garden, 100 feet in diameter, was chosen as being the most susceptible to frost, and a piece of ground that could be most easily and most effectually smudged. A pile of dry straw and coarse manure was heaped on the windward side of this garden. Two thermometers were placed in this plot, one in the centre, 2 feet above the ground, the other on the outer edge, on the ground; two other instruments were in their stand, 200 feet away, and out of the direct course of the smoke. On the night of the 12th of September everything indicated frost. At sundown the thermometer began to go down rapidly, and at nine o'clock 33 degrees was recorded. The smudges were at this point started, and for two and a-half hours one continual volume of smoke enveloped the garden. So dense was the smoke that when the thermometer in the centre of the garden was examined a lantern had to be used to find it. Every fifteen or twenty minutes all the instruments were examined, and no difference whatever was observed in any one of them. The smoke, on leaving the flower bed, enveloped or passed over a field of oats; these, with the flowers, were all frozen. You will remember when here on the 26th of August how rapidly the temperature fell on that evening, and that while you attended to the thermometers men and teams were piling up straw in heaps in a large field of grain containing between seventy and eighty experimental plots. These piles of straw, though happily not required that night, were on the 12th of September in the right place, and part of them added their gusts of smoke in the attempt to save the grain from injury. Unfortunately no house was in front of these piles as there was in front of the flower garden, and instead of settling over the plots the smoke took a direct line upwards, and was practically of no use.

The temperature fell on this occasion to 23, or 9 degrees of frost. Whether smoke with only three or four degrees of frost would be of any use is doubtful, though believed in by many. The fact of our four thermometers going down together seems to me to point to only one conclusion, namely, that smoke is ineffectual in saving grain from frost.

From the test made on the 12th September, I would strongly advise farmers not to place much reliance on smoke in saving their wheat, but rather to trust in good seed early sown.

WHEAT TESTS.

RESULT of sowing on different dates; one-tenth acre plots; 9 lbs. of seed (or at rate of 1½ bushels per acre); sown by drill; land in same condition.

Variety of Wheat.	Sown.	Came up.	Headed.	Ripe.	Matured in	Height.	Weight, Grain and Straw.	Weight per Bushel.	Yield per Acre.	
					Days.	Feet.	Lbs.	Lbs.	Bush.	lbs.
White Connell	April 6	April 23	July 27	Sept. 14	161	4¼	830	61¼	34	00
	do 13	do 28	do 27	do 14	154	4¼	740	61¼	32	00
	do 20	May 3	do 27	do 14	147	4½	780	61¼	32	50
	do 27	do 11	do 25	do 14	140	4½	955	61¼	34	30
	May 4	do 15	do 29	do 14	133	4¼	805	60	32	30
	do 11	do 21	do 29	do 14	126	4¼	835	60	33	00
Campbell's White Chaff.	April 6	April 24	do 23	do 8	155	4¼	845	63	30	26
	do 13	do 28	do 23	do 8	148	4¼	800	63	35	30
	do 20	May 4	do 23	do 9	142	4½	855	63	34	00
	do 27	do 11	do 22	do 9	135	4½	935	63	37	46
	May 4	do 15	do 24	do 9	128	4¼	870	62¼	35	30
	do 11	do 21	do 24	do 9	121	4¼	882	62¼	36	10

RESULT of sowing different varieties on same date; half-acre plots; 1½ bushels per acre; sown by drill on fallow. All varieties, except Red Fife, were injured by wind in May. The Indian sorts were badly hurt.

Variety of Wheat.	Sown.	Came up.	Headed.	Ripe.	Matured in	Height.	Condition of Grain	Weight per Bushel.	Yield per Acre.	
					Days.	Feet.		Lbs.	Bush.	lbs.
Gehun	April 13	April 28	July 16	Sept. 7	147	3½	Good...	65¾	22	40
Club Bombay	do 13	do 28	do 16	do 7	147	3	do ..	60	24	30
Blue Stem	do 13	do 28	do 29	do 14	154	4¾	Frozen..	54¼	28	20
Green Mountain	do 13	do 27	do 29	do 14	154	4½	do ..	55¼	24	48
Imp. Summer Cob......	do 13	do 27	do 28	do 14	154	4½	do ..	56½	30	16
Azima Russian.........	do 13	do 28	do 27	do 14	154	4¼	do ..	57	31	16
Russian Ghirka.........	do 13	do 27	do 27	do 14	154	4½	do ..	59½	32	00
Old Red River..........	do 13	do 27	do 27	do 14	154	4½	do ..	57¼	35	12
French Imperial........	do 13	do 27	do 27	do 14	154	4¾	do ..	55½	27	16
Colorado................	do 13	do 24	do 24	do 14	154	4¼	do ..	57¾	33	36
Hard Red Calcutta.....	do 13	do 27	do 13	do 7	147	3¼	Good...	63¼	21	40
White Delhi.........	do 13	do 28	do 6	do 7	147	3	do ..	61½	22	00
Pringle's Champlain....	do 13	do 24	do 25	do 12	152	4¾	Frozen..	58	34	00
Red Fife................	do 13	do 28	do 25	do 12	152	4½	do ..	60	38	20
Chilian White	do 13	do 28	do 24	do 14	154	4¼	do ..	59½	29	36
Golden Drop............	do 13	do 27	do 25	do 14	154	4¼	do ..	57¾	37	00
Red Connell............	do 13	do 28	do 25	do 14	154	4½	do ..	57½	33	20
Karachi..........	do 13	do 26	do 16	do 11	151	3½	Good...	58	22	00
Assiniboia...	do 13	do 27	do 23	do 14	154	4¾	Frozen..	58	32	38

RESULT of sowing different varieties on the same date; one-tenth acre plots; 9 lbs. seed; sown by drill; fallow land. Colorado destroyed by winds and the India varieties greatly injured.

Variety of Wheat.	Sown.	Came up.	Headed.	Ripe.	Matured in	Height.	Weight, Grain and Straw.	Weight per Bushel.	Yield per Acre.	
					Days.	Feet.	Lbs.	Lbs.	Bush.	lbs.
Campbell's White Chaff.	April 11	April 27	July 21	Sept. 5	147	4¾	730	63¼	33	56
Campbell's Triumph....	do 11	do 27	do 25	do 11	153	4¼	630	63½	33	30
Red Fife.	do 11	do 27	do 25	do 12	154	4¾	810	62	44	20
White Fife.	do 11	do 27	do 27	do 12	154	4¾	750	62	39	20
Ladoga...	do 11	do 27	do 25	do 5	147	4½	680	63¼	33	20
Anglo-Canadian..	do 11	do 27	Aug. 1	do 14	156	4¾	490	53¼	25	56
*Colorado	do 11	do 24	....	....	......	......	......	......	......	......
Indian Hard Calcutta ..	do 11	do 27	July 16	do 5	147	3½	482	63¼	27	10
Red Fern......	do 11	do 28	do 27	do 11	153	4¾	680	60½	35	50
Judket.	do 11	do 28	do 27	do 11	153	4¾	698	61	32	40
Rio Grande	do 11	do 28	do 27	do 12	154	4½	590	60½	30	00
Russian Hard Tag.....	do 11	do 27	do 25	do 12	154	4½	550	61¾	31	15
Saxonka.....	do 11	do 28	do 25	do 12	154	4¾	690	60½	32	30
White Delhi............	do 11	do 28	do 15	do 5	147	3	250	61½	24	40
White Russian..........	do 11	do 27	do 24	do 11	153	4¼	590	61¼	34	30
Wellman's Fife.........	do 11	do 28	do 27	do 11	153	5	760	60	33	50
Pringle's Champlain ...	do 11	do 27	do 24	do 11	153	4¾	800	58	38	50
White Connell..........	do 11	do 28	do 25	do 12	154	4½	870	61¼	38	40
Defiance.	do 11	do 28	do 27	do 12	154	4½	610	60	33	10
Australian.	do 11	do 28	do 23	do 12	154	4¾	695	61¼	38	30
Gehun	do 11	do 27	do 16	do 5	147	3¼	300	65¾	34	40
Genessee..............	do 11	do 28	do 23	do 12	154	4¼	600	64	33	00

*Destroyed by winds.

RESULT of sowing at different dates; 1½ bushels per acre; sown by drill on fallow.

FIELD PLOTS.

Variety of Wheat.	Sown.	Came up.	Headed.	Ripe.	Matured in	Height.	Weight per Bushel.	Yield per Acre.	
					Days.	Feet.	Lbs.	Bush.	lbs.
Ladoga..........................	April 6	April 23	July 21	Sept. 1	148	5	63¼	36	46
do	do 7	do 24	do 21	do 1	147	5	63¼	36	40
do	do 8	do 24	do 24	do 5	150	5	63¼	32	00
Red Fife........................	do 6	do 24	do 25	do 11	158	4¼	62½	51	10
do	do 7	do 25	do 25	do 11	157	4¼	62½	48	10
do	do 8	do 27	do 28	do 11	156	4¼	62½	48	10
White Fife......................	do 11	do 27	do 28	do 12	154	4¼	62	33	00
White Connell	do 11	do 25	do 28	do 12	154	4¼	61¼	39	40
Campbell's White Chaff..........	do 17	May 1	do 23	do 4	140	4¾	63¼	52	00
Red Fern...........	do 17	April 30	do 23	do 4	140	5	60½	32	20
Eureka.	do 17	do 30	do 23	do 4	140	5	60	23	15

LADOGA *vs.* RED FIFE.

Sown same date; land fallowed, and in same condition and same quantity of seed.

Ladoga..........................	April 6	April 23	July 21	Sept. 1	148	5	63¼	36	46
do	do 7	do 24	do 21	do 1	147	5	63¼	36	40
do	do 8	do 24	do 24	do 5	150	5	63¼	32	00
do	do 11	do 27	do 25	do 5	147	4½	63¼	33	20
Red Fife....................... .	do 6	do 24	do 25	do 11	158	4¼	62½	51	10
do	do 7	do 25	do 25	do 11	157	4¼	62½	48	10
do	do 8	do 27	do 28	do 11	156	4¼	62½	48	10
do	do 11	do 27	do 25	do 12	154	4¼	62½	44	20

RESULT of sowing different quantities of seed per acre; land in same condition; one-tenth acre plots.

Variety of Wheat.	Quantity per Acre.	Sown.	Came up.	Headed.	Ripe.	Matured in	Height.	Weight per Acre.	Yield per Acre.
						Days.	Feet.	Lbs.	Bush. lbs.
Red Fife	1 bush.	April 17	May 2	July 24	Sept. 14	150	4½	61½	33 40
	1¼ do	do 17	do 2	do 24	do 14	150	4½	61½	34 10
	1½ do	do 17	do 2	do 24	do 15	151	4½	61	31 40
	1¾ do	do 17	do 2	do 24	do 15	151	4½	60	29 15

RESULT of sowing different depths; same quantity of seed; land in same condition.

Variety of Wheat.	Depth.	Sown.	Came up.	Headed.	Ripe.	Matured in.	Height.	Weight per Acre.	Yield per Acre.
						Days.	Feet.	Lbs.	Bush. lbs.
Red Fife	1 in.	April 17	May 2	July 24	Sept. 15	151	4½	61½	36 00
	2 in.	do 17	do 3	do 24	do 15	151	4½	61	31 00
	3 in.	do 17	do 4	do 24	do 15	151	4¾	60	32 40
	4 in.	do 17	do 13	do 24	do 15	151	4¼	57	28 20

RESULT of different ways of seeding; same quantity; land in same condition.

Variety of Wheat.	Sown with.	Sown.	Came up.	Headed.	Ripe.	Matured in.	Height.	Weight per Bushel.	Yield per Acre.
						Days.	Feet.	Lbs.	Bush. lbs.
Red Fife	Broadcast	April 17	May 4	July 28	Sept. 15	151	4½	57	38 20
	Drill	do 17	do 4	do 24	do 15	151	4½	58	32 40
	Press....	do 17	do 5	do 24	do 15	151	4¼	58	30 10

RESULT of different grades of seed sown; same quantity per acre; land in same condition; one-tenth acre plots.

Variety of Wheat.	Kind of Seed.	Sown.	Came up.	Headed.	Ripe.	Matured in.	Height.	Weight per Bushel.	Yield per Acre.
						Days.	Feet.	Lbs.	Bush. Lbs.
Red Fife	No. 1 hard	April 17	May 4	July 24	Sept. 12	148	4½	59	32 40
	No. 1 frozen...	do 17	do 4	do 24	do 12	148	4½	61	31 50
	No. 2 do ...	do 17	do 4	do 24	do 12	151	4	59	31 10
	No. 3 do ...	do 17	do 4	do 24	do 12	151	4	62	38 10
RESULT OF FALL PLOUGHING *vs.* FALLOW.									
Red Fern.......	Fall ploughed.	April 17	May 3	July 23	Sept. 4	140	5	60½	32 40
	Fallow	do 17	do 4	do 23	do 4	140	5	60½	34 20
ROOT LAND *vs.* FALLOW.									
Red Fife.......	Root land	April 8	April 24	July 25	Sept. 9	154	4¼	63½	51 10
	Fallow	do 8	do 27	do 25	do 11	156	4¼	63	48 10

RESULT of cutting grain before being ripe. One-twentieth of an acre, in a field of five acres of Red Fife wheat, was cut on the 19th, of August, or 20 days before being ripe. Every fourth day, until ripe, the same quantity was cut. All were threshed and results carefully weighed, and are given below.

Variety of Wheat.	Sown.	Came up.	Headed.	Cut.	Before Matured.	Height.	Weight per Bush.	Yield per Acre.	
					Days.	Feet.	Lbs.	Bush.	lbs.
Red Fife....................	April 8	April 24	July 25	Aug. 19	20	4¼	50	14	40
do	....	....	....	do 23	16	4¼	51½	16	00
do	....	....	....	do 27	12	4¼	54	25	20
do	....	....	....	do 31	8	4¼	56	30	20
do	....	....	....	Sept. 4	4	4¼	58	36	50
do	....	....	....	do 8	0	4¼	63	42	10

RESULT of tests of cross-bred wheat produced by Prof. Wm. Saunders at the Central Experimental Farm, Ottawa. The returns obtained were very fine samples.

Variety of Wheat.	Bald or Bearded	Sown.	Quantity Sown, Kernels.	Came up.	Quantity came up, Kernels.	Quantity Killed after coming up, Kernels.	Ripe.	Height.	Matured in.	Cross between.		Yield.	
								Feet.	Days.	Female.	Male.	Lb.	oz.
Alpha......	Bald ...	April 21	48	May 9	33	6	Sept. 1	4½	134	Ladoga...	White Fife	0	9
Beta	Bearded	do 21	50	do 9	42	12	do 2	4½	135	do ...	Red do	0	9
Abundance.	do	do 21	48	do 9	30	10	do 5	4½	138	do ...	do do	0	6
Prince......	do	do 21	50	do 9	37	3	do 4	4½	137	do ...	White do	1	1
Ottawa.....	do	do 21	50	do 9	36	0	do 4	4½	137	do ...	Red do	1	2
Carleton....	do	do 21	50	do 9	36	1	do 4	4½	137	do ...	White do	0	13

RESULT of treatment for Smut, one-tenth acre plots. Treatment :—1 lb. bluestone, dissolved in warm water ; 1 pail of water added, and mixed with 10 bushels of wheat. Same quantity bluestone and one-half the quantity of water, mixed with 5 bushels of wheat. Seed all black with smut. Six feet square of each plot cut and every head counted.

Variety of Wheat.	Quantity Bluestone.	Quantity Wheat.	Sown.	Came up.	Headed.	Ripe.	Matured in.	Height.	Pure Heads.	Smut Heads.	Weight per Bush.	Yield per Acre.
	Lbs.	Bush.					Days.	Feet.			Lbs.	Bush.
Red Fife....	1	5	April 17	May 3	July 24	Sept. 12	148	4¼	2,038	17	62	32·00
do	1	10	do 17	do 6	do 24	do 12	148	4¼	1,789	270	61	29·30
do	Untreated...		do 17	do 3	do 24	do 12	148	4¼	1,011	1,010	57	24·10

RESULT of Treatment for Smut, plots 10 feet square. These wheats were sent to Ottawa and treated by F. T. Shutt, M.A., Chemist of Experimental Farm. All were more or less affected with smut, the Judket badly so. Every head in each plot was counted.

Variety of Wheat.	How Treated.	Sown.	Came up.	Headed.	Ripe.	Matured in.	Pure Heads.	Smut Heads.
						Days.		
White Connell	Untreated	Apl. 8.	Apr. 25.	July 18.	Sept. 10.	155	3,479	6
do	Sulphate of copper	do 8.	do 25.	do 18.	do 10.	155	3,423	7
do	Agricultural bluestone	do 8.	do 25.	do 18.	do 10.	155	3,942	3
do	Sulphate of iron	do 8.	do 25.	do 18.	do 10.	155	3,575	6
Red Fife	Untreated	do 8.	do 25.	do 20.	do 12.	157	3,789	164
do	Sulphate of copper	do 8.	do 25.	do 20.	do 12.	157	4,420	1
do	Agricultural bluestone	do 8.	do 25.	do 20.	do 12.	157	3,973	7
do	Sulphate of iron	do 8.	do 25.	do 20.	do 12.	157	3,722	168
White Fife	Untreated	do 8.	do 23.	do 20.	do 12.	157	3,690	10
do	Sulphate of copper	do 8.	do 23.	do 20.	do 12.	157	3,840	0
do	Agricultural bluestone	do 8.	do 23.	do 20.	do 12.	157	3,810	0
do	Sulphate of iron	do 8.	do 23.	do 20.	do 12.	157	3,595	2
Judket	Untreated	do 8.	do 23.	do 18.	do 15.	160	3,905	49
do	Sulphate of copper	do 8.	do 23.	do 18.	do 15.	160	3,761	1
do	Agricultural bluestone	do 8.	do 23.	do 18.	do 15.	160	3,850	0
do	Sulphate of iron	do 8.	do 23.	do 18.	do 15.	160	3,960	38

RESULT of Grain sown in fall. Fall wheat, spring wheat and rye sown in fall, 1890.

Variety of Wheat.	Fall or Spring Grain.	Sown.	Came up.	Headed.	Ripe.	Weight per Bushel.	Yield per Acre.	Remarks.
						Lbs.	Bus. lbs	
Canadian Velvet Chaff	Fall	Oct. 27.	Apr. 20.	July 24.	Sept. —	55	....	Cut Sept. 12, but not ripe; frozen; 3 lbs. sown, 20 lbs. yield.
Saxonka	Spring	do 27.	do 24.	do 24.	do 12.	60¼	20 27	
Giant Reading Rye	Fall	do 27.	do 24.	do 24.	do 12.	54½	....	3 lbs. sown; 70 lbs. return.

The following varieties of fall and spring wheats sown the past fall, 1891, will be reported on in next annual report:—

Variety.	Sown.	Came up.
Early Red Clawson	September 9	September 19.
Jones's Winter Fife	do 9	do 19.
Tasmania	do 9	do 19.
Fall Wheats.		
Martin's Amber	do 9	do 22.
Golden Cross	do 9	do 22.
Early Red Clawson	October 28	Did not germinate.
Canadian Velvet Chaff	do 28	Did not germinate.
Royal Prize	do 28	Did not germinate.
Spring.		
Democrat	do 28	Did not germinate.
Manchester	do 28	Did not germinate.
Ladoga	do 28	Did not germinate.

BARLEY TESTS.

Result of sowing at different dates; one-tenth acre plots. Two varieties of barley were sown on 6th April, and continued each week up to 11th May. The first two sowings were destroyed by wind and frost, and the third a good deal injured. The condition of land, quantity of seed ($9\frac{1}{2}$ lbs.), &c., were exactly the same; land fallowed year previous; crop very heavy, but badly lodged.

Variety of Barley.	Sown.	Came up.	Headed.	Ripe.	Matured in.	Height.	Weight, Grain and Straw.	Weight per Bushel.	Yield per Acre.	
					Days.	Feet.	Lbs.	Lbs.	Bush.	lbs.
Prize Prolific..........	April 6	April 23	Destroyed by frost and winds.							
	do 13	do 27								
	do 20	May 2	July 22	Sept. 2	135	$4\frac{1}{4}$	500	52	40	30
	do 27	do 9	do 20	do 2	128	4	710	53	54	28
	May 4	do 13	do 22	do 2	121	4	670	53	54	00
	do 11	do 19	do 22	do 2	114	$3\frac{3}{4}$	680	$53\frac{1}{4}$	50	40
Baxter's Six-rowed	April 6	April 23	Destroyed by frost and winds.							
	do 13	do 27								
	do 20	May 1	July 18	Sept. 15	148	$4\frac{1}{4}$	305	51	27	40
	do 27	do 9	do 16	Aug. 27	122	4	540	53	40	00
	May 4	do 13	do 18	do 27	115	4	589	$53\frac{1}{2}$	44	18
	do 11	do 19	do 18	do 27	108	$3\frac{3}{4}$	660	$53\frac{1}{2}$	50	10

Result of sowing different varieties on same date; one-half acre plots; land fallowed; same quantity seed sown, $1\frac{3}{4}$ bushels per acre.

Variety of Barley.	Sown.	Came up.	Headed.	Ripe.	Matured in.	Height.	Weight per Bushel.	Yield per Acre.	
					Days.	Feet.	Lbs.	Bush.	lbs.
Peerless	April 15	April 27	July 24	Sept. 9	147	$4\frac{1}{4}$	54	36	21
Danish Chevalier................	do 15	do 28	do 24	do 9	147	$4\frac{1}{2}$	52	44	20
Danish Printice Chevalier	do 15	do 28	do 24	do 9	147	$4\frac{1}{2}$	52	40	00
Prize Prolific	do 15	do 28	do 24	do 9	·147	$4\frac{1}{2}$	$53\frac{3}{4}$	45	00
Thanet..........................	do 15	do 28	do 24	do 9	147	$4\frac{1}{2}$	$52\frac{3}{4}$	49	00
Golden Melon, 2-rowed...........	do 15	do 28	do 24	do 9	147	$4\frac{1}{2}$	54	42	10
Selected Chevalier, 2-rowed ...	do 15	do 28	do 24	do 9	147	4	54	50	36
Duck-bill, 2-rowed..............	do 15	do 28	do 17	do 1	139	5	$50\frac{3}{4}$	60	00
New Zealand, 2-rowed...........	do 15	do 28	do 18	do 2	140	4	$52\frac{1}{4}$	37	18
Sharp's Improved................	do 15	do 28	do 22	do 9	147	4	53	47	10
Large 2-rowed Naked	do 15	do 28	do 14	do 2	140	$3\frac{1}{2}$	$63\frac{1}{4}$	26	35
Mensury, 6-rowed	do 15	do 28	do 17	do 2	140	$4\frac{1}{4}$	$50\frac{1}{4}$	43	00
Rennie's Improved, 6-rowed.....	do 15	do 28	do 18	do 2	140	$4\frac{1}{2}$	$51\frac{3}{4}$	46	33
Spiti Valley Feed	do 15	do 28	do 4	Aug. 11	118	$3\frac{1}{2}$	$57\frac{1}{4}$	24	33

Eighteen plots of one-tenth acre each were sown on the 13th April, on fallowed land, with a similar quantity of seed per acre. The grain came up on the 27th and 28th of April, but they were destroyed by wind and frost during the first week of May.

RESULT of sowing at different dates; land fallowed; 1¾ bush. seed per acre; field plots.

Variety of Barley.	No. Acres Sown.	Sown.	Came up.	Headed.	Ripe.	Matured in.	Height.	Weight per Bushel.	Yield per Acre.	
						Days.	Feet.	Lbs.	Bush.	lbs.
Duck-bill..............	3	April 8	April 23	July 24	Sept. 3	147	5	53½	43	10
Chevalier.	1	do 15	do 30	do 27	Aug. 31	137	4¼	50¾	37	10
California Prolific....	1	do 27	May 13	do 15	do 27	121	5	53¼	65	00

Eight other varieties were sown on the 14th, 15th and 16th April, but all were so badly injured in May as to be of no value for comparison; similar results attended the sowing of Duck-bill barley, where different quantities of seed were sown per acre, varying from 1¼ to 2 bushels.

RESULT of different methods of seeding land fallow; 1¾ bush. per acre; one-tenth acre plots.

Variety of Barley.	How Sown.	Sown.	Came up.	Headed.	Ripe.	Matured in	Height.	Weight per Bushel.	Yield per Acre.	
						Days.	Feet.	Lbs.	Bush.	lbs.
Duck-bill	Broadcast	April 17	May 4	July 24	Sept. 15	151	4½	53	42	00
	Drill	do 17	do 4	do 24	do 7	143	5	53	32	44
	Press...........	do 17	do 4	do 24	do 7	143	5	53	35	30

FALLOW *vs.* ROOT LAND.

Duck-bill	Kind of land—									
	Root.............	April 8	April 23	July 24	Aug. 31	144	5	53	43	10
	Fallow..........	do 15	do 28	do 17	Sept. 1	139	5	53¼	60	00

SPRING PLOUGHING *vs.* FALLOW.

Chevalier..... ...	Kind of land—									
	Spring ploughed.	April 15	April 30	July 27	Aug. 31	131	4¼	50¾	37	10
	Fallow	do 15	do 30	do 24	Sept. 9	147	4½	52	44	20

EARLY *vs.* LATE SEEDING.

Prize Prolific.....	....	April 6	April 23	} Destroyed by frost and winds.						
	....	do 13	do 27							
	....	do 20	May 2	July 22	Sept. 2	135	4¼	53½	40	30
	....	do 27	do 9	do 20	do 2	128	4	53¾	54	28
	....	May 4	do 13	do 22	do 2	121	4	53¾	54	00
	....	do 11	do 19	do 22	do 2	114	3¾	53¾	50	40
	....	June 2	June 10	Aug. 5	Aug. 15	105	3½	49	38	00

OAT TESTS.

Thirty-two varieties of oats were sown; all but 12 of these were destroyed by wind. The only kind not injured was Winter Grey; all those sown previous to the 16th April were too much injured to admit of comparison.

RESULT of sowing at different dates; fallow land; sown with drill, 8½ lbs. seed used, equal to 2½ bush. per acre; one-tenth acre plots.

Variety of Oats.	Sown.	Came up.	Headed.	Ripe.	Matured in	Height.	Weight, Grain and Straw.	Weight per Bushel.	Yield per Acre.	
					Days.	Feet.	Lbs.	Lbs.	Bush.	lbs.
Prize Cluster	April 6	April 27	Destroyed by frost and winds.							
	do 13	May 4								
	do 20	do 7	July 28	Sept. 1	134	5	830	48¾	84	30
	do 27	do 12	do 23	do 1	127	5¼	855	48¾	86	24
	May 4	do 16	do 25	do 1	120	5	830	48¾	82	04
	do 11	do 21	do 25	do 1	113	5	835	48¾	86	20
Banner	April 6	April 26	Destroyed by frost and winds.							
	do 13	May 4								
	do 20	do 7	July 28	Sept. 15	148	5¼	815	43¼	86	24
	do 27	do 12	do 24	do 7	133	5¼	995	43¼	88	04
	May 4	do 16	do 27	do 7	126	5¼	950	43¼	84	22
	do 11	do 21	do 27	do 7	119	5¼	840	42¼	77	22

RESULT of sowing different varieties on same date; fallow land; sown by drill; 2½ bush. per acre; one-tenth acre plots.

Variety of Oats.	Sown.	Came up.	Headed.	Ripe.	Matured in.	Height.	Weight per Bushel.	Yield per Acre.	
					Days.	Feet.	Lbs.	Bush.	lbs.
Winter Grey	April 17	May 4	July 20	Aug. 27	131	5	46½	102	00
Early Gothland	May 4	do 21	do 24	Sept. 10	122	4½	44¼	51	00
Archangel	April 17	do 4	do 24	do 1	136	4½	40	61	00
Swedish	do 17	do 4	do 30	do 19	155	4½	39	60	00
Bonanza	do 17	do 4	do 30	do 2	137	4¾	47	72	22
Am Beauty	do 17	do 4	do 30	do 10	146	4½	42¼	89	16
Rosedale	do 17	do 4	Destroyed by winds.						
White Russian	do 17	do 4							
Black Champion	do 17	do 4							

RESULT of sowing at different dates; fallow land; 2½ bush. per acre; field plots.

Variety of Oats.	Sown.	Came up.	Headed.	Ripe.	Matured in.	Height.	Weight per Bus.	Yield per Acre.	
					Days	Feet	Lbs.	Bush.	lbs.
Cream Egyptian	May 13	May 23	July 29	Sept. 8	118	5	45¾	86	00
Welcome	do 13	do 22	do 25	do 3	113	5	44¾	78	18
Black Tartarian	do 25	June 8	Aug. 3	do 17	115	5	41	89	20
Potato	do 25	do 8	do 3	do 10	108	5	44	80	00
Black Tartarian	do 29	do 10	do 7	do 18	112	5	41	89	00

RESULT of sowing different quantities per acre; land fallowed; one-tenth acre plots.

Variety of Oats.	Quantity per Acre.	Sown.	Came up.	Headed.	Ripe.	Matured in	Height.	Weight per Bush.	Yield per Acre.
						Days	Feet	Lbs.	Bush. lbs.
Prize Cluster	1½ bushels	April 17	May 4	Destroyed by winds.					
do	2 do	do 17	do 4						
do	2½ do	do 17	do 4	July 24	Sept. 10	146	4¾	48¾	85 24
do	3 do	do 17	do 4	do 24	do 9	145	4¾	47½	80 10

RESULT of different methods of sowing; fallow land; 2½ bush. per acre; one-tenth acre plots.

Variety of Oats.	How Sown.	Sown.	Came up.	Headed.	Ripe.	Matured in	Height.	Weight per Bush.	Yield per Acre.
						Days	Feet.	Lbs.	Bush. lbs.
Prize Cluster	Broadcast ..	April 17	....	Destroyed by winds.					
do	Drill	do 17	May 6	July 24	Sept. 7	143	5	48	79 16
do	Press	do 17	do 4	Destroyed by winds.					

STUBBLE *VS.* FALLOW.

Cream Egyptian was sown on stubble and fallow. That on fallow was destroyed. On stubble drilled in it yielded 86 bush. per acre on 5 acres.

TESTS OF DIFFERENT VARIETIES SOWN ON SAME DATE.

Land fallowed; sown with drill, 2½ bush. per acre; one-tenth acre plots. Twenty-five different plots were included in this test. All were sown on the 14th April; were up from the 27th April to 1st May, but all were too much injured by wind and frost in first week in May to admit of comparison.

PEA TEST.

Pease, like the barley and oats, were greatly damaged by the winds. The field lots were entirely killed. The one-tenth acre plots were somewhat protected by buildings and did not suffer so much, but were subsequently injured by heavy rains which flooded part of the plots.

RESULT of sowing on same date; land fallowed and in good condition. Black Eyes and White Marrowfat, sown at the rate of 3 bushels; the remainder, 2½ bushels per acre; one-tenth acre plots.

Variety.	Sown.	Came up.	Podded.	Ripe.	Matured in	Length of Straw.	Weight per Bushel.	Yield per Acre.	
					Days.	Feet.	Lbs.	Bush.	lbs.
Black Eyes............	April 17..	May 11..	July 28..	Sept. 5..	141	4½	65	19	40
Multiplier	do 17..	do 11..	Aug. 4..	do 5..	141	5	64½	18	30
Extra Early..........	do 17..	do 11..	July 18..	Aug. 21..	126	3¾	64	15	04
Prince Albert.........	do 17..	do 11..	Aug. 1..	Sept. 5..	141	6	64	25	00
White Marrowfat.....	do 17..	do 11..	July 24..	do 5..	141	4	65	21	40
Crown.................	do 17..	do 11..	Aug. 1..	do 5..	141	6	65½	30	10
Prussian Blue.........	do 17..	do 11..	July 28..	do 5..	141	6	65	24	00
Mummy..............	do 17..	do 11..	Aug. 1..	do 2..	138	4	65½	20	37

FODDER TESTS.

Five mixtures of grain were sown on fallow, 6th April. Five mixtures and rye alone were sown on stubble land on 16th and 18th April. Three of those sown on fallow were destroyed, and re-sown 1st June. The yield of cured hay in each case is given.

RESULT of sowing on fallow; seed drilled in.

Fodder.	Sown.	Came up.	Cut.	Remarks.
Wheat and rye	April 6	April 24	Aug. 10	Yield per acre, 8,000 lbs.
Oats and pease	do 6	do 24	do 10	do 7,900 do
Rye and barley	do 6	do 24	....	Re-sown with barley and oats 1st June; cut, 10th August; yield, 5,200 lbs.
Barley and oats	do 6	do 24	....	
Oats and rye	do 6	do 24	....	

RESULT of sowing on fall ploughing, spring ploughing (gang ploughed), and on stubble randled in.

Fodder.	Sown.	Came up.	Cut.	Remarks.
Wheat and oats, fall ploughed	April 18	May 1	Aug. 6	Yield, 4,700 lbs. per acre.
do spring do	do 18	do 1	do 6	do 6,200 do
do randled	do 18	do 1	do 6	do 6,000 do

RESULT of sowing on spring ploughing; stubble land; stubble burned; seed gang-ploughed in.

Fodder.	Sown.	Came up.	Cut.	Remarks.
Oats and rye	April 16	May 1	Aug. 6	Yield, 6,900 lbs. per acre.
Wheat and oats	do 16	do 1	do 3	do 7,200 do
Pease and oats	do 18	do 1	do 5	do 7,000 do
Rye and barley	do 18	do 1	do 3	do 5,200 do
Rye, wheat and oats	do 16	do 1	do 4	do 5,640 do
Rye	do 18	do 1	do 4	do 4,830 do

RESULTS of Millets and Rape sown on fallow; cut and put in silo green.

Variety.	Sown.	Came up.	Cut.	Remarks.
Common Millet	June 2	June 15	Aug 18	Yield, 6,000 lbs. per acre.
German do	do 2	do 15	do 18	do 6,230 do
Hungarian Grass	do 2	do 15	do 18	do 2,940 do
Rape	do 3	do 12	do 29	do 24,000 do
Chana	do 18	do 26	....	Attained a height of 3 feet when frozen on Sept. 12.
Marsa	do 18	do 26	....	6 inches high when frozen on Sept. 12.

FODDER CORN.

Thirty-one varieties of corn were sown by drill in rows of 3 feet apart for fodder. The land was fallowed the year before, and in good condition. All the sorts came up well, except Dakota Gold Coin, the seed of which was bad. When about 6 inches high, cold, wet weather set in and the plants continued to make slow pro-

gress until the end. For fear of frost the corn was cut on 7th September, and put in silo in a green state. The weight per acre is computed from two rows of each sort, 66 feet long in green state. North Dakota and Red Blazed gave much the best yield; both seemed to stand the cool nights better than the other sorts.

Variety.	Sown.	Came up.	Tasselled.	Silk.	Early Milk.	Cut.	Height.	Yield per Acre.	
							Ft.	Tons.	lbs.
Blunt's Prolific	May 23.	June 15.				Sept. 7.	4½	8	720
Golden Dent	do 23.	do 15.				do 7.	5	9	920
Chester Co. Mammoth	do 23.	do 16.				do 7.	3	5	450
Virginia Horse Tooth	do 23.	do 18.				do 7.	3¾	4	360
Golden Beauty	do 23.	do 16.				do 7.	4	6	540
Mammoth Southern Sweet	do 23.	do 15.				do 7.	4¼	4	1900
Giant Prolific Ensilage	do 23.	do 16.				do 7.	4½	8	1380
Salzer's Superior Fodder	do 23.	do 16.				do 7.	3½	5	1990
King Philip	do 23.	do 17.	Aug. 18.			do 7.	4¼	8	60
Longfellow	do 23.	do 17.	Sept. 2.			do 7.	4¼	9	1140
Long White Flint	do 23.	do 17.	Aug. 18.			do 7.	4½	6	1200
Long Yellow Flint	do 23.	do 17.	Sept. 2.			do 7.	4½	7	1180
Thoroughbred White Flint	do 23.	do 17.	do 2.			do 7.	4½	7	1400
Early Yellow Dutton	do 23.	do 15.				do 7.	3¾	7	1950
Canada Yellow	do 23.	do 15.	Sept. 2.			do 7.	3¾	6	1330
Pearce's Prolific	do 23.	do 17.	do 2.			do 7.	3¼	5	450
Mitchell's Early	do 23.	do 15.	Aug. 3.	Aug. 10.	Sept. 2.	do 7.	3½	4	1460
Yellow Flint	do 23.	do 15.	do 13.	Sept. 2.		do 7.	4¾	7	1180
North Dakota	do 23.	do 15.	do 18.	do 2.		do 7.	5	10	1670
Dakota Gold Coin	do 23.	do 22.				do 7.	3¼	3	270
Eight-rowed Sugar	do 23.	do 17.				do 7.	3¾	6	210
Egyptian	do 23.	do 18.				do 7.	3½	6	870
Extra Early Cory	do 23.	do 17.	Aug. 3.	Aug. 10.	Sept. 2.	do 7.	3¾	6	1310
Pea & Kay	do 23.	do 15.	do 18.	Sept. 2.		do 7.	4¼	6	1090
Early Mammoth	do 23.	do 18.				do 7.	3¾	5	1330
Asylum Sweet	do 23.	do 17.				do 7.	3	5	670
Potter's Excelsior	do 23.	do 20.				do 7.	3½	6	650
Stowell's Evergreen	do 23.	do 15.	Sept. 2.			do 7.	3¼	5	670
Cinquantine	do 23.	do 18.	Aug. 18.	Sept. 2.		do 7.	3¾	5	1220
Red Blazed	do 22.	do 15.	do 18.			do 7.	5¼	10	20
Red Cob Ensilage	do 23.	do 15.				do 7.	4¼	5	1990

CORN.

Fourteen varieties were planted on a piece of ground that had been fallowed and well manured, with a view of testing their earliness. Everything was done possible to force the plants, in the way of hoeing and cultivating. No weight is given of the yield, as the frost on 12th September was severe enough to cut the corn to the ground.

Variety.	Sown.	Came up.	Tasselled.	Silk.	Early Milk.
Squaw Corn	May 19.	June 8.	July 30.	Aug. 3.	Sept. 2
Yellow Flint	do 19.	do 10.	do 30.	do 3.	do 2
White Flint	do 19.	do 10.	Aug. 3.	do 3.	do 2
Mitchell's Extra Early	do 19.	do 10.	do 3.	do 10.	do 2
Extra Early Cory	do 19.	do 12.	do 3.	do 10.	do 2
Mammoth Southern Sweet	do 19.	do 12.			
Pearce's Prolific	do 19.	do 15.	Aug. 18.		
Perry's Hybrid	do 19.	do 20.	do 18.		
Red Blazed	do 19.	do 20.	do 18.	Sept. 2.	
Giant Prolific	do 19.	do 20.			
Large Eight-rowed	do 19.	do 20.			
Potter's Excelsior	do 19.	do 20.			
Asylum Sweet	do 19.	do 20.	Sept. 2.		

EXPERIMENTS WITH BUCKWHEAT, FLAX AND RYE.

Variety.	Sown.	Came up.	Headed.	Cut.	Weight per Bushel.	Yield per Acre.	
					Lbs.	Bush.	lbs
Rye..	April 6..	April 20..	June 22..	Aug. 25..	56	27	00
Buckwheat.	June 3..	June 12..	....	Sept. 7..	54	19	17
Flax.	do 3..	do 12..	.. ..	do 15..	.....	14	00

GRASSES AND CLOVERS.

A good deal of attention was given to this important subject the past season; besides sowing in small plots at different times and in different ways, larger plots were sown in the fields, both on bare land and with grain. Many of the small plots were blown out, and a good deal of that sown among the grain was injured, but on the whole the season has been the most favourable one since the farm started for a fair catch.

Nineteen varieties of cultivated grasses and clovers and 33 native grasses were sown in small plots 10 feet square. Meadow Fescue, sown 16th April, was 3 feet high when cut on 3rd September; Orchard Grass, 2 feet 9 inches; Meadow Oat Grass, 3 feet 2 inches; Perennial Rye, 20 inches; Timothy, 23 inches; Bromus Inermis, 38 inches, and Red, Mammoth and Scarlet Clovers, 20 inches; Native grasses sown in April, cut on 3rd September, were: Bromus segetum, 26 inches; Bromus ciliatus, 27 inches; Bromus Pumpellianus, 36 inches; Elymus Canadensis, 36 inches; Muhlenbergia sylvatica, 18 inches; Muhlenbergia glomerata, 22 inches; Muhlenbergia Mexicana, 24 inches. All the above native sorts are very fine grasses and well worthy of cultivation.

The following, sown in spring of 1889, were cut for hay 1890, and the past season gave as follows:—

Timothy, 4,800 lbs. per acre of cured hay; Meadow Fescue, 4,600 lbs.; Orchard Grass, 4,000 lbs.; Lucerne, 5,000 lbs.; Alsike, 3,500 lbs., and Mammoth Clover, sown in 1890, gave 3,600 lbs.

A second cut of Timothy was 28 inches high; Lucerne, 24 inches; Orchard Grass, 36 inches; Sanfoin, 18 inches. In addition to the above, which have lived two winters and produced a good crop the past season, are the Pasture Grasses, Hard and Sheep Fescue, Red Top, Kentucky Blue Grass and White Clover, the latter doing especially well.

Phalaris Canariensis (Canary Seed Grass) sown in April attained a height of 26 inches and ripened its seed by 3rd September. Without giving the names of all the varieties sown this year, it may be said that the cultivated and native sorts mentioned above are all suitable for this part of the North-West. In cultivated sorts, Meadow Fescue, Orchard Grass, Lucerne and Alsike appear to do the best.

ROOTS.

Turnips.—A large and satisfactory crop of this root was obtained, gesides two large plots for testing yields of varieties. Several acres were sown, so as to have a large supply for the stock. Plots were sown on the 11th and 23rd of May on land fallowed the previous year. Before sowing a good ploughing, harrowing and rolling was given the land. Drills were made with plough, and seed sown by turnip drill. After the plants came up they were hoed or scuffled each week until covering the ground.

A difference will be observed in yield in favour of early sowing. Purple Top varieties were the finest in shape, quality, evenness on ground, weight, and were the easiest to pull. The weight per acre of turnips, mangels, carrots and beets is computed from weighing three drills, 66 feet each, of each sort.

TURNIPS.

Variety.	Sown.	Came up.	Pulled.	Yield per Acre.
				Bush.
Purple Top Swede (Rennie)	May 11	May 20	Oct. 23	1,086
Carter's Elephant do	do 11	do 20	do 23	871
Elephant (Steele)	do 11	do 20	do 23	1,069
Selected Purple Top (Steele)	do 11	do 20	do 23	1,086
Bangholm (Simmers)	do 11	do 20	do 23	1,086
Highland Prize Purple Top (Simmers)	do 11	do 22	do 23	1,086
Marquis of Lorne (Bruce)	do 11	do 22	do 23	959
Hartley's Bronze (Pearce)	do 11	do 22	do 23	871
Imperial (Webb)	do 11	do 21	do 23	1,056
New Giant King (Webb)	do 11	do 20	do 23	960
Mam. Purple Top (Evans)	do 11	do 21	do 23	941
Clyde Improved do	do 11	do 20	do 23	1,047
Monarch (Pearce)	do 11	do 20	do 23	928
Clyde Improved (Evans)	do 23	June 6	do 23	906
Bangholm (Simmers)	do 23	do 6	do 23	950
Imperial (Webb)	do 23	do 6	do 23	871
Mam. Purple Top (Evans)	do 23	do 6	do 23	800
Elephant (Steele)	do 23	do 6	do 23	812
New Giant King (Webb)	do 23	do 6	do 23	686
Highland Prize Purple Top (Simmers)	do 23	do 10	do 23	907
Purple Top (Rennie)	do 23	do 6	do 23	809
Purple Top (Steele)	do 23	do 6	do 23	811
Hartley's Bronze (Pearce)	do 23	do 10	do 23	656
Elephant Giant King (Rennie)	do 23	do 6	do 23	683
Marquis of Lorne (Bruce)	do 23	do 10	do 23	634
Yellow Aberdeen (Rennie)	do 23	do 6	do 23	894
Purple Top Stubble (Sutton)	do 23	do 6	do 23	1,175
Champion Purple Top do	do 23	do 6	do 23	872
Elephant Purple Top (Rennie)	June 1	do 11	do 24	836
Skirving's Improved (Steele)	do 1	do 11	do 24	690
Lord Derby (Webb)	do 1	do 11	do 24	792
Large White Globe	do 1	do 11	do 24	781
Greystone	do 1	do 11	do 24	982

Mangels.—Mangels were sown on the 9th and 23rd of May. The land was in the same condition as the turnip land, and the same attention was paid to it before and after seeding as was given the turnips. The seed was sown on the flat and the plants thinned out to 14 inches. A good catch was obtained, and the plants did extra well until a hail storm, on the 20th July, riddled the leaves. This put them back greatly, and when frost came on the 12th September and stopped all further growth they had hardly attained half their size.

A difference in yield will be observed in favour of early sowing.

MANGELS.

Variety.	Sown.	Came up.	Pulled.	Yield per Acre.
				Bush.
Mammoth Long Red (Rennie)	May 9	May 23	Sept. 28	572
do (Steele)	do 9	do 23	do 28	572
do (Webb)	do 9	do 23	do 28	440
do (Evans)	do 9	do 23	do 28	550
do (Simmers)	do 9	do 23	do 28	576
Giant Yellow Globe (Rennie)	do 9	do 23	do 28	475
do (Bruce)	do 9	do 23	do 28	493
Canada Giant (Pearce)	do 9	do 23	do 28	585
Gate Post (Bruce)	do 9	do 23	do 28	554
Champion Yellow Globe (Webb)	do 9	do 23	do 28	475
Yellow Tankard (Webb)	do 9	do 23	do 28	422
Golden Tankard (Evans)	do 9	do 23	do 28	492
Carter's Orange Globe (Bruce)	do 9	do 23	do 28	497
Giant Intermediate (Steele)	do 9	do 23	do 28	615
Mammoth Long Red (Webb)	do 23	June 11	do 28	360
do (Evans)	do 23	do 11	do 28	484
do (Rennie)	do 23	do 11	do 28	299
do (Steele)	do 23	do 11	do 28	361
do (Simmers)	do 23	do 11	do 28	418
do (Sutton)	do 23	do 11	do 28	361
Gate Post (Pearce)	do 23	do 11	do 28	334
Carter's Orange Giant (Pearce)	do 23	do 11	do 28	352
Yellow Intermediate (Steele)	do 23	do 11	do 28	295
Giant Yellow Globe (Bruce)	do 23	do 11	do 28	294
Giant Orange Globe do	do 23	do 11	do 28	303
Yellow Globe (Webb)	do 23	do 11	do 28	352
do (Rennie)	do 23	do 11	do 28	360
Yellow Tankard (Webb)	do 23	do 11	do 28	290
Gate Post (Bruce)	do 23	do 11	do 28	378

CARROTS.

This crop was, as in all previous years, very poor. The hail storm which injured the mangels greatly hurt the carrots also, but their slow growth while young and our short season is very much against a good return. All the conditions of land and attention were the same as for turnips, except that the carrots were sown in drills 18 inches apart on the flat.

Variety.	Sown.	Came up.	Pulled.	Yield per Acre.
				Bush.
Improved Short White (Steele)	May 9	May 23	Oct. 6	308
Early Gem (Rennie)	do 9	do 23	do 5	220
Large White Vosges (Rennie)	do 9	do 23	do 6	352
do (Simmers)	do 9	do 23	do 6	279
Half Long Scarlet (Rennie)	do 9	do 23	do 6	271
Mam. Intermediate White (Rennie)	do 9	do 23	do 6	294
Green Top Orthe (Pearce)	do 9	do 23	do 6	367
Oxheart (Steele)	do 9	do 23	do 6	278
Large White Vosges (Bruce)	do 9	do 23	do 6	293
James's Intermediate (Pearce)	do 9	do 23	do 6	248
Mitchell's Perfection (Pearce)	do 9	do 23	do 6	183
Chantenay (Bruce)	do 9	do 23	do 6	248
Short White (Pearce)	do 9	do 23	do 6	366
Orange Giant (Pearce)	do 9	do 23	do 6	300
Yellow Belgian	do 9	do 23	do 6	110
Yellow Intermediate (Webb)	do 9	do 23	do 6	293
Scarlet Altringham (Webb)	do 9	do 23	do 6	117

Sugar Beets.—Three sorts were tested under the same conditions as the mangels.

Variety.	Sown.	Came up.	Pulled.	Yield per Acre.
				Bushels.
Red Top Sugar..........	May 9	May 23...	Sept. 28...	345
German Sugar Beet (Bulteau Desprez)............	do	do	do	374
do do do (Klein Wanzleben)	do	do	do	343

Potatoes.—Seventy-six varieties of potatoes were planted in May; 15 of these were seedlings from the Central Experimental Farm at Ottawa. The land had been fallowed the year previous, and was deeply ploughed, harrowed, and a good coating of well-rotted manure put on before planting. Drills 3 feet apart were opened and the sets dropped 14 inches apart. The ground received a good harrowing as the young plants came up, and each week the scuffler was used until the plants covered the ground, when they were ridged up with the plough.

When taken up two drills of each sort 66 feet long were weighed, and the yield per acre computed from these.

The first 36 varieties had marketable or eatable potatoes on the 4th of August; the balance had none. Among the later sorts three varieties, Empire State, White Star and Richter's Gem are very fine, and, as shown, gave much better returns than many of the earlier sorts. The largest yield obtained was from a seedling, No. 80, of the Central Farm. The tubers were very large but rough, and of a poor quality. Two seedlings, No. 20 and 21, are very fine potatoes, having few eyes, very shallow, with smooth skin, good size, are early and good croppers.

Each week, commencing on the 4th of August up to the 27th, one hill of each sort was lifted and counted. From the 27th August up to lifting, 1st October, two hills were taken up, counted and weighed.

The number and weight of each sort from the two hills on 27th August are given in table below, as well as yield per acre when they were all taken up.

Variety.	Planted.		Came up.		Growth.	*Marketable (2 hills.)	*Small (2 hills.)	*Weight		Taken up.	Yield per Acre.
								Lbs.	oz.		Bush.
Rosy Morn........	May	15	June	18	Strong .	9	1	1	6	Oct. 1..	294
Clarke's Triumph................	do	15	do	15	do ..	16	2	3	2	do 1..	304
Early Rose....	do	15	do	15	do ..	11	3	2	8	do 1..	309
Sharpe's Seedling................	do	15	do	15	do ..	7	2	3	2	do 1..	297
Early Puritan.......	do	15	do	15	do ..	12	11	3	2	do 1..	293
Chicago Market.	do	15	do	15	do ..	12	2	4	2	do 1..	339
Beauty of Hebron..............	do	15	do	15	do ..	16	....	2	8	do 1..	298
Vanguard.........................	do	15	do	18	Fair....	11	6	2	12	do 1..	227
Algoma, No. 1............... ..	do	15	do	18	do	10	2	1	14	do 1..	196
Early Maine......	do	15	do	18	do	9	3	1	10	do 1..	236
Rose Valley.....................	do	15	do	18	Strong .	13	4	3	12	do 1..	396
Ohio Gunner.....	do	15	do	22	Fair....	9	1	1	8	do 1..	150
Halton Seedling....	do	15	do	15	Strong .	10	5	2	3	do 1..	258
Lizzie's Pride...............	do	15	do	15	do ..	12	3	3	8	do 1..	348
London.	do	15	do	18	Fair....	9	5	2	3	do 1..	218
Brownell's Best	do	15	do	18	Strong .	9	2	1	12	do 1..	293
Early Summer..	do	15	do	18	do ..	13	2	2	13	do 1..	348
Early Ohio..	do	15	do	20	Fair....	8	2	1	12	do 1..	194
Empress Belle.....	do	15	do	23	Strong .	6	3	2	10	do 1..	311
Snowflake..........................	do	15	do	18	do ..	10	2	2	8	do 1..	322
Seedling, No. 20............ ..	do	15	do	18	do .	28	7	3	7	do 1..	350
Late Rose....	do	15	do	15	do ..	13	4	3	2	do 1..	348
Prolific.	do	15	do	18	do ..	6	....	1	14	do 1..	194
Jumbo.	do	15	do	18	Weak ..	8	2	1	12	do 1..	168

NUMBER and Weight of different varieties of Potatoes, &c.—*Concluded.*

Variety.	Planted.	Came up.	Growth.	*Marketable (2 hills.)	*Small (2 hills.)	*Weight (2 hills.) Lbs.	oz.	Taken up.	Yield per Acre.
						Lbs.	oz.		Bush.
Assiniboia	May 15	June 16	Strong	12	2	4	4	Oct. 1..	366
Lee's Extra Early	do 15	do 20	do	10	3	2	13	do 1..	275
Seedling, No. 21	do 15	do 22	do	8	1	2	5	do 1..	306
Wonder of the World	do 15	do 21	do	15	3	3	12	do 1..	293
White Elephant	do 15	do 19	Weak	9	....	2	14	do 1..	381
Bliss' Triumph	do 15	do 22	do	7	2	1	2	do 1..	173
Queen of the Valley	do 19	do 10	Strong	9	2	4	..	do 1..	395
Crown Jewel	do 19	do 10	do	11	4	3	12	do 1..	385
Stray Beauty	do 19	do 10	Fair	14	2	3	4	do 1..	280
Goodrich	do 23	do 24	Strong	9	....	2	4	do 1..	175
Rose's New Giant	do 15	do 18	do	15	1	3	6	do 1..	377
Early Conqueror	do 15	do 18	do	9	3	2	..	do 1..	286
Later Varieties.									
Empire State	do 15	do 15	do	9	....	2	14	do 1..	374
White Star	do 15	do 15	do	11	2	2	6	do 1..	326
Marigold	do 15	do 18	Weak	5	....	..	10	do 1..	157
Richter's Elegant	do 15	do 18	Fair	8	2	1	..	do 1..	216
Brownell's Beauty	do 15	do 23	do	10	3	1	12	do 1..	220
Thorburn	do 15	do 18	Strong	12	5	2	6	do 1..	216
Count Moltke	do 15	do 18	do	13	7	2	8	do 1..	311
May Queen	do 15	do 17	Fair	9	1	1	12	do 1..	238
Richter's Gem	do 15	do 18	Strong	22	13	3	6	do 1..	396
Surprise	do 15	do 15	do	9	4	1	7	do 1..	275
St. Patrick	do 15	do 15	do	16	4	2	12	do 1..	348
Lee's Favourite	do 15	do 18	Weak	5	5	1	3	do 1..	183
Early Eating	do 15	do 15	Fair	8	2	2	1	do 1..	217
Delaware	do 15	do 18	Strong	9	9	3	8	do 1..	330
Brownell's Winner	do 15	do 18	Fair	9	1	1	8	do 1..	188
Clarke's No. 1	do 15	do 18	do	7	7	3	..	do 1..	306
Rural Blush	do 15	do 18	Strong	9	7	2	8	do 1..	306
Seedling, No. 2	do 15	do 18	Fair	9	....	3	3	do 1..	297
Stonewall Beauty	do 15	do 18	Weak	6	2	1	6	do 1..	280
Seedling, No. 18	do 15	do 18	Fair	16	8	1	9	do 1..	188
do No. 53	do 15	do 15	Strong	13	1	1	12	do 1..	196
Early Bird	do 15	do 15	do	7	....	1	8	do 1..	201
Seedling, No. 5	do 15	do 23	Fair	7	1	1	4	do 1..	236
do No. 15	do 15	do 15	do	7	2	1	9	do 1..	220
Seedling, No. 9	do 15	do 18	Strong	5	5	1	6	do 1..	280
Harrison	do 15	do 20	do	11	2	3	9	do 1..	253
Manhatten	do 15	do 18	Fair	9	6	2	4	do 1..	293
Seedling, No. 98	do 15	do 22	Strong	7	12	1	5	do 1..	123
do No. 80	do 15	do 15	do	10	3	3	4	do 1..	463
do No. 141	do 15	do 22	do	19	2	3	3	do 1..	240
do No. 209	do 15	do 22	do	11	1	1	9	do 1..	201
do No. 83	do 15	do 28	Fair	8	4	1	6	do 1..	232
Telephone	do 15	do 22	do	13	7	2	7	do 1..	220
Seedling, No. 170	do 15	do 26	do	14	3	1	12	do 1..	256
Sugar	do 15	do 27	do	9	2	1	10	do 1..	220
Vermont	do 23	do 24	do	8	5	1	6	do 1..	213
Member of Parliament	do 23	do 24	do	7	2	1	8	do 1..	205
Seedling, No. 10	do 23	do 24	do	5	0	1	6	do 1..	225
Rural New Yorker	do 23	do 24	do	4	3	1	0	do 1..	220
Large Callao	do 23	do 24	Weak	8	2	1	5	do 1..	210

* 27th August.

GARDEN VEGETABLES.

Several sorts of each kind of vegetable were sown last spring in hopes of finding the earliest and best for the North-West. In cabbage, 13 sorts were tested; in cauliflower, 7 varieties; in onions, 10; pease, 8, &c. Some of these were destroyed by winds and could not be replaced in time to be of any use.

The kinds recommended are not given as absolutely the best varieties to grow in the North-West under all circumstances. These have done best on the experimental farm where everything is exposed to severe wind storms and might, with protection, either natural or artificial, be worthy of only 2nd or 3rd place.

BEETS.

Three varieties were tested—Eclipse, Lentz and Long Red.
Eclipse and Lentz are recommended.

BEANS.

Sixteen varieties of beans were planted. Six were much earlier than the others, and though none matured before frost cut them down, these can be recommended: Dwarf Mohawk, Early Refugee, Giant Wax, Golden Wax, Kidney and Date ditto. The following also were planted on the 23rd May but did not mature, being cut down by frost: Golden Eye Wax, Sugar Podded, Hundred-to-One, Ne Plus Ultra, Sion House, Negro Black, Black Speckled, Chevrier, Nettle-leaved White, Lima.

The English Horse Bean was also planted, grew 3 feet 6 inches in height and produced a most abundant lot of pods, but was cut down with frost before maturing

CARROTS.

Five sorts were sown on the 9th April; all were destroyed. Three varieties were sown again on 16th April. These were Early Gem, Peer of All and Intermediate. Peer of All was injured, but all three did well and are recommended.

CABBAGE.

Thirteen varieties of cabbage were tried, mostly all early sorts. Early Epping and Early Summer were the two earliest and best, Vandergroff 2nd; Jersey Wakefield and Extra Early Etampes take 3rd place. Henderson's Early Summer was the best cabbage grown.

The following were sown in hot-bed 30th March, transplanted in hot-bed 19th April, transplanted in garden 11th May, and were fit to use 20th July: Early Epping and Early Summer.

The following were sown and transplanted same dates as above and ready to use as follows: Vandergroff, 25th July; Early Etampes, 30th July; Jersey Wakefield, 30th July.

The following were sown and transplanted in hot-bed same date as above, transplanted in garden, 29th May, and ready to use, as follows: Extra Early Eclipse, 30th July; Bo-Peep, 5th August; Red Erfurt, 15th September. Autumn King and Savoy were sown 18th April and transplanted 29th May, and ready to use 15th September.

CAULIFLOWER.

Five varieties were tested: Dwarf Erfurt, Giant White Pearl, Early Snow Ball, Algerian and Le Normand.

The first three sorts proved much the best, Snowball being first in all respects.

Seed was sown in hot-bed 30th March, transplanted in hot-bed 19th April, and in ground on the 11th May. Snowball was fit to use on the 9th July, Dwarf Erfurt and Giant White Pearl soon after.

CELERY.

White Plume, Giant White, Golden Yellow and Giant Pascal were sown in hot-bed 1st April; transplanted in hot-bed 1st May and in garden 17th June. White Plume was the earliest in use and the best variety, Giant White 2nd, Giant Pascal and Golden Yellow about equal. The trench and flat system were both tried. The celery on the flat was very poor, while in the trench it was very good.

CUCUMBERS.

Early Cluster, Medium Green, Giant Pera and White Pearl were sown in hot-bed 19th May and transplanted on 5th June. Early Cluster and Medium Green were first in bearing, but none matured.

CITRON

Was sown in hot-bed 19th May, transplanted 5th June. Destroyed by frost 12th September, with fruit very small.

LETTUCE.

Seven sorts were tried. Toronto Gem, Big Boston and Black-seeded Simpson were sown 9th April and destroyed by winds.

Sure Head and Big Boston were also sown 22nd April. White Romain, Golden Queen and Nonpareil sown 29th May.

Big Boston proved by far the best, and while all the others may be pronounced good this is specially recommended for the North-West.

ONIONS.

Yellow Danvers, Mammoth Pearl, Southport, White Globe, Red Wethersfield, White Barletta and Spanish King were sown in ground from 16th April to 9th May.

Yellow Danvers and Red Wethersfield gave a fair crop. The remainder gave very poor returns.

White Pearl, Giant Roca, White Gargons and Spanish King were sown in hot-bed on 27th March, transplanted in garden 1st June. Not a plant was lost in transplanting and all grew from the first. White Pearl and Giant Roca gave the largest yield and were the best onions. White Gargons was the earliest. Spanish King not so good as the two first, which are recommended.

PEASE.

Champion of England, American Wonder, Yorkshire Hero and Pride of the Market were sown 22nd April. These gave pease fit to use and were ripe in the following order:—

American Wonder, 12th July, 14th August.

Yorkshire Hero, 20th July, 25th August.

Pride of the Market, 1st August, 1st September.

Champion of England, 1st August, 1st September, respectively.

On the 9th May the above varieties and Ex. Early Premium Gem, Stratagem, Heroine and McLean's were sown. American Wonder proved again the earliest, giving green pease on 18th July and ripe 13th August, Ex. Early Premium Gem being second, and gave green pease 20th July, ripe 13th August. Stratagem, Yorkshire Hero and Pride of the Market gave green pease 4th August and ripe 1st September, while Heroine, McLean's and Champion gave green pease 8th August and ripe 5th September. In quality Stratagem, Yorkshire Hero, Heroine and Champion of England were sweet and large, and better liked than the others.

PARSNIPS.

Hollow Crown was sown 9th and 22nd April; the first sowing was destroyed; the second was a fair crop.

RADISH.

Seven varieties of radish were sown from 9th April to 1st July. They were Olive Gem, Rosy Gem, Olive Shaped and Scarlet Button as summer sorts, and Black Spanish California White and China White winter varieties. The four summer varieties were all good, and can be safely recommended. Of the winter sorts, Black Spanish alone came to anything; the other two went entirely to seed.

RHUBARB.

Rhubarb of any variety does well. The rankest grown is Stott's Mammoth. This with Paragon, Victoria, Myatts, Linnæus and Carleton Club are the five sorts growing on the farm. Stott's Mammoth did best. Myatts Linnæus and Victoria did next best, and are about equal.

SPINACH.

Round Summer and Savoy Leaved were sown 16th April and 9th May. The early sown were destroyed by wind, but both sorts sown 9th May did well and were first in use 15th June.

SQUASH.

Boston Marrow-White. Bush scalloped and short green Bergin were sown 2nd June; grew fairly well, but did not mature; frost on 12th September destroyed them.

TURNIPS.

Five varieties of turnips were sown in garden. Imported Purple Top Swede, Marquis of Lorne, Six Weeks, Greystone and Breadstone. Six Weeks was the earliest to mature or come in use, but the Imported Purple Top is by far the best quality for cooking, though correctly speaking, not a garden turnip.

TOMATOES.

Dwarf Champion, Early Ruby, General Grant, Conqueror and Strawberry were sown in hot-bed 30th March, transplanted in hot-bed 30th April, and into garden 3rd June. Fruit formed on Early Ruby on 3rd July, and ripened 27th August. Fruit formed on the other sorts from the 5th to 15th July, but none ripened.

FLOWERS.

A circular flower garden, 100 feet in diameter, was planted in the fall of 1890 with a variety of flowering bulbs, and last spring 34 varieties of other flowers were planted or sown. Many of these made fine bloom during the season, but were cut down by frost 12th September. Pansies and Verbenas revived somewhat after the frost.

The following are the bulbs set out:—Those that flowered: Double Early Tulips, Single Early Tulips, Parrot Tulips, Lilium Umbellatum, Scilla Amœna; Iris Hispanica of the following varieties: Belle Ardine, Rigobettu, Ogyges, Tantalus, L'Aimable, La Perle, Sappho, La. Sicilum, Iris Wm. George; Lilium Incomparable, Lilium Multiflorum, Lilium Grandiflorum, Lilium Thunbergianum, Lilium Atrosanguineum, Lilium Thunbergibnum Aureum, Colchium Autumnale.

Those that did not flower: Bulbocodium Vernum, Double Late Tulips, Lilium Candidum, Narcissus Incomparabile, Narcissus Poeticus, Narcissus Phœnix, Narcissus Stella, Narcissus Polyanthus, Iris Hispanica, Lagaite, Single Hyacinth, Mixed Crocus.

Those that died were: Double Hyacinth, Polyanthus Narcissus Gloriosa Superba, Galanthus Elwesü.

The following were sown or planted in the spring. Those are extra good and are suitable for the North-West: Pansy, Godetia, Carnation, Mignonette, Petunia, Dianthus Imperialis, Dianthus Heddewigi, Phlox Drummondü, Grandiflora, large flowering fringed, Grandiflora, single flowering fringed, Superbissima, Chrysanthemum, Gladiolus, Sweet Peas, Poppies, Dwarf Alyssum, Verbenas, Sweet William, Abronia, Candytuft, Stocks, Pyrethrum, Nemophila, Flowering Flax, Pinks and Asters.

The following were only fair: Scabiosa White and Royal Purple, Salpiglossis Nigella. Globe Amaranths did not do well.

FRUIT TREES.

In May, 1890, 500 Russian seedling apple trees were planted all lived, made a good growth, and came through the last winter in good condition. During the past season they made very gratifying progress and it is hoped and expected that they will stand the present winter. Last spring 42 named Russian varieties were put out and have made a good growth.

Of the apple trees set out prior to the spring of 1890 very few survive. A few Russian varieties of dwarf trees are still in existence, but not very promising.

Red Siberian Crab is the only variety of crab apple that stands. One tree of this sort, planted in 1888, is still living, grows a little each year, but very little.

PEARS AND CHERRIES.

A Russian seedling variety of pear planted in spring of 1890 succumbed to last winter's severity; as also did the Koslov Morello Cherry, White Black Hill Cherry and a variety not named but marked "M. No. 6" are living but were cut back.

GRAPES.

Nineteen varieties of grapes were planted in May, 1890. Each root was put down 18 inches below the surface, and as growth took place earth was filled in until the level of the surface was reached, in hopes that the roots being so far down would be out of harm's way. Before winter set in a heavy covering of coarse manure was heaped over each root, but all of no avail; every root was dead last spring.

CURRANTS.

Currant bushes came through the winter in good condition, and made an early start in the spring. But winds and frost in May destroyed all early-formed blossoms and only one sort, Black Naples, was at all well fruited. Fay's Prolific and Lee's Prolific had a few berries. Victoria, Raby Castle, Red Dutch, White Grape, White Dutch and Champion had none. Last spring 12 additional seedling varieties were planted.

GOOSEBERRIES.

Gooseberries, like the currants, were injured by the early frosts and had little or no fruit. Smith's improved had a few very fine berries. Houghton or Downing were nearly fruitless.

RASPBERRIES.

Up to the present 21 named varieties of raspberries have been tested on this farm besides 6 hybrids. Of the sorts tried Turner and Philadelphia have made the largest growth of cane, stand the winter and spring the best and produce the most fruit. Caroline and Cuthbert for the first time made a fine growth of cane and gave a few fine berries the past season. The canes are laid down before frost comes each fall, and covered with earth, and after the ground freezes up are covered with coarse manure.

Last spring 11 new seedling varieties were planted.

STRAWBERRIES.

Two varieties of strawberries bore fruit last season; these were New Dominion and Capt. Jack. The Wilson, though living through three winters, has never borne fruit. Frost in May killed all early blossom.

FOREST TREES.

Very little was done in foreign trees last spring. A few shrubs were set out and made a good growth.

In our native sorts 14,075 were transplanted, being either seedling or 2-year-olds. They were chiefly planted in a wind-break along the north boundary of farm or

in wind-breaks near the buildings. These wind-breaks were planted 65 feet apart, between which fruit trees, roots, grain, &c., will be grown. A few hundred of our native poplar were also planted. In the fall of 1890 tree seeds of maple, ash, oak, elm, cherry, hazel and saskatoon were sown in large quantities, in all two acres, and in May last nine acres of maples and ash were sown. Of the fall sowing, maple, ash, oak, elm, hazel and saskatoon came up. The maples were entirely killed soon after appearing above ground, but the rest, especially the young oak, made a satisfactory growth. Of the spring sowing about $\frac{1}{3}$ of the maple came, but none of the ash. The maples have made a good growth. 14,450 forest trees from Nebraska were set out in May 1890. These made a fair growth during that season, but this spring all the cottonwoods, locusts, walnuts, butternuts and Russian mulberry were found to be dead. White ash, green ash, soft maple, white elm and coffee tree, Russian olive and red cedar, were all badly cut back, the great majority to the ground.

The favourable season caused a good growth from the ash and elm, but the maples and coffee trees, olive and cedar made little or no progress. Besides the trees from Nebraska, 4,947 were received from the Central Experimental Farm, Ottawa. Many of the pines died soon after being set out, and of those living only about one dozen Scotch pine came through the winter and are living now. All the spruce, larch, arbor vitæ, juniper, hickory, chestnut, butternut, Russian mulberry and linden were killed. A few Norway maples are living. White, black and green ash and the elm were badly cut back, many entirely killed. White birch and mountain ash coming out best and did well all the past season.

SHRUBS.

Of the shrubs planted, the *Caragana arborescens* has done extra well, and of all foreign trees or shrubs this seems to stand our climate by far the best, and may be put down as very suitable for the North-West. *Syringa alba* (*lilac*) also stands the climate well, and though little growth is made in a season none so far have died and some progress is being made. *Spiræa opulifolia* and *Ribes aureum* (flowering currant) stood last winter and did well the past season. All the other shrubs, such as Syringas Berberis, &c., have all or nearly all been killed. *Artemisia abrotans* planted on the farm in May, 1890, stood last winter, and being a very fast and thick grower, makes the best hedge or wind-break of anything so far tried, and promises to be very suitable for wind-breaks around gardens or for small enclosures.

WILLOWS AND POPLARS.

In willows *Salix Voronesh* and *Salix acutifolia* stand the climate well, and every spring start to grow from the tips. All other sorts, such as white willow, yellow willow, purple willow, Norway willow, Wisconsin weeping willow and Salix *laurifolia* are cut back each winter and are not suitable. In poplars, *Populus* Wobstii, Riga and *Populus aurea* start each spring from the tips.

SUMMER FALLOWS.

In my last report I stated that two plans were being tested in working fallow on the experimental farm. One was gang ploughing in the fall, as soon after harvest as possible, so as to start weeds, and plough and complete the work the following season; the other to do all the work in the one season—that is, from May to November. So far as the crop was concerned no difference could be detected the past season between the two modes of working. On both the grain was very heavy and greatly lodged; the piece of land gang-ploughed in the fall was very full of weeds the previous year. The past season not one appeared, while on land worked in one season weeds in great numbers came up where the crop was at all blown in the spring.

For this reason, and on account of the fall system being much the easiest managed, as it does away with all volunteer grain, it should be more frequently followed. The land on the experimental farm was worked in several ways the past season. Part

was ploughed deeply early in the spring and afterwards the weeds and volunteer grain kept down by harrow or gang-plough.

Another part was first gang-ploughed 3 inches deep and afterwards ploughed 6 inches deep with walking plough. Another portion was gang-ploughed twice with one harrowing between. On account of the great amount of stubble on the ground and of the risk of damage by fire if the attempt was made to burn it no gang-ploughing was done this fall.

STOCK.

As stated in my last report, four pure breeds of stock were secured last year for the farm. These were: Durhams, 1 male and 4 females; Holsteins, 1 male and 3 females; Aberdeen Polled Angus, 1 male and 2 females; and Ayrshire 1 male and 3 females—in all, 16 animals. 12 grade animals were also obtained in this neighbourhood.

Shortly after the arrival of the stock a Polled Angus and Durham cow aborted, and during the winter the Holstein cow, "Bonnie Ethels Mercedes," a Polled Angus calf and a grade heifer died, it is thought from drinking very cold water which had to be drawn in tanks daily from the dam.

During the winter and spring 11 head have been added to the herd by births: 1 Durham bull and heifer, 2 Ayrshire bulls, 1 Polled Angus heifer, 1 Holstein heifer and 5 grades. Up to 1st January, 1892, there have been added 2 Polled Angus heifers, 1 Holstein heifer and 3 grades.

During the season farmers availed themselves of the use of the 4 bulls to a considerable extent, considering the limited number of cows in this locality.

Three young bulls, 1 Durham and 2 Ayrshire, will be ready for service this coming season and will be sold to settlers.

STALLION.

In the latter part of May last the Percheron stallion "Clement" reached the farm from Montreal for service in the neighbourhood. Although rather late in arriving, 40 mares were served, giving good satisfaction. A Clyde or Shire stallion would prove much more acceptable to the farmers in the Territories than a Percheron, no matter how good the Percheron may be.

SILO.

Early last spring a silo was built in the barn. Though not very large, it is quite large enough to test the practicability of making and keeping ensilage in the North-West.

The silo is 10x12 ft., inside measurement, and runs from basement floor 12 ft. above barn floor, a height of 22 feet; the portion above the barn floor is exposed to very severe cold.

Green fodder was cut and placed in silo as follows:—

Aug. 3rd and 4th, rye, wheat and oats.
" 5th, rye and oats.
" 6th, wheat.
" 6th, rye and oats.
" 13th, barley and oats.
" 18th, millets and Hungarian grass.
" 29th, rape.
Sept. 3rd and 4th, corn.
" 5th, corn.

In all 43 tons. At present the corn is being fed to the stock, which eat it readily. For 8 inches on top and a little on sides, the ensilage is found bad, but all inside that is good and well preserved.

A coating of hay was placed over the corn, which has been the only protection or covering from the cold it has had.

IMPROVEMENTS.

In addition to the silo above mentioned, an underground hen-house has been built and material obtained for an internal fence to enclose about one hundred acres of the farm. This fence will be erected early next spring and will do away with the herding of the stock, which had to be done last season. A windmill was put up on the barn last summer, which draws water from a reservoir nearly 1,000 feet away, grinds grain, cuts straw and is found a very great convenience, especially in furnishing a plentiful supply of water during the winter months. The pipes from the reservoir were put down 7 feet deep to protect them from frost, and when cold weather came on a thick covering of coarse manure was spread on the ground the entire distance.

POULTRY.

Having no hen-house last spring or any other place in which the breeds of fowls could be kept separate, they did very poorly. In fact, except an increase of half a dozen, our flock is the same now as then.

With the new and comfortable building now in use, it is hoped better success will be had in future.

METEOROLOGICAL.

Temperature and rainfall, maximum and minimum, for 12 months; rainfall during the growing season.

TEMPERATURE.

Months.	Maximum.	Minimum.
January	43° on 19th	— 27° on 15th and 31st.
February	29° on 4th	— 41° on 2nd.
March	39° on 30th	— 38° on 6th.
April	87° on 23rd	5° on 2nd and 3rd.
May	89° on 17th	12° on 4th.
June	79° on 18th	28° on 3rd.
July	83° on 30th	40° on 24th and 25th.
August	88° on 4th	37° on 22nd.
September	85° on 9th	23° on 13th.
October	70° on 8th	12° on 26th.
November	56° on 5th	— 16° on 17th and 27th.
December	41° on 12th	— 41° on 25th.

RAINFALL.

	Inches.
April	0
May	— 97
June	6 — 19
July	3 — 84
August	2 — 14
September	·86
October	·03
Total	14·03

EXHIBITIONS ATTENDED.

Products of the farm were sent to the Winnipeg industrial exhibition, and shown there in connection with those from the Manitoba experimental farm. The exhibit from this farm consisted of 55 varieties of wheat in straw, 3 varieties in bags and 7 in bottles; 18 varieties of barley in straw, 8 in bags and 8 in bottles; 14 varieties of oats in straw, 6 in bags and 7 in bottles; 15 varieties of field and

garden pease in bottles, besides samples of buckwheat, rye and tares in straw, and cabbage and turnip seed in bottles. There were also exhibited 55 varieties of named native grasses, many of which are being cultivated on the farm; 16 sorts of cultivated grasses and clovers, all grown on the farm last season; 75 varieties of potatoes and 4 varieties of onions. A collection of 15 sorts of turnips were sent down, but on account of want of space were not shown.

The exhibitions at Saltcoats and Yorkton, in the northern part of the province, were also attended. As these exhibitions were held at the same time as others along the line of the Canadian Pacific Railway, it was impossible to reach more than the above.

I have the honour to remain,

Your obedient servant,

ANGUS MACKAY,

Superintendent.

EXPERIMENTAL FARM FOR BRITISH COLUMBIA.

REPORT OF THOMAS A. SHARPE, SUPERINTENDENT.

AGASSIZ, B.C., 31st December, 1892.

To WM. SAUNDERS, Esq.,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith my report for 1891, being the third annual report of the work done on the experimental farm at Agassiz.

The weather during January was very mild and rainy, but in February it turned colder, and there were sharp frosts at night with bright sunshine during the day. The previous rains had left the land very wet, and the freezing and thawing heaved the small fruits, strawberries, currants, raspberries, &c., out of the ground, and caused the loss of quite a number of those which were newly planted, but did not injure anything that had been planted the spring previous.

The spring did not open quite so early this year as in 1890. In that year we began seeding on 3rd April; this year the first grain was sown 8th April. The season was cold and wet during April and the first half of May, and in consequence the early sown-grain did not make much progress during that time, showing less difference in time of heading and ripening than is usually the case where there is so much difference in the time of sowing.

About 25 acres of new land has been grubbed and ploughed this summer, and 8 acres of the old land manured and summer fallowed and sown with fall wheat, and will be seeded to timothy and clover next spring.

About 5 acres of new land has also been summer fallowed, having been ploughed several times and harrowed frequently with the disc and drag harrows, to see what effect this treatment will have in exterminating the ferns, and it is to be hoped that there will be but little trouble with this weed in that piece of ground in future.

A new fence has been put up on the west side of the farm and about three-quarters of a mile on the north and south sides is levelled and graded, and the fence will be built before spring.

The total area of land now broken up and ready for crop on the experimental farm is 105 acres, and may be summarized as follows:—

	Acres.
Planted in orchard	26
Under crop in 1891	51
Summer fallow	13
New land broken up during summer of 1891	15
Total	105

Notwithstanding the rather unfavourable weather in the spring of 1891 the area under crop in this province was considerably greater than ever before, and the crop generally was a good average.

The number of fruit trees and small fruit plants planted this year is far in excess of any previous year, and the prospects are that before long British Columbia will have not only enough fruit for home consumption but also a large surplus for export.

FALL WHEAT.

Fourteen varieties of fall wheat were sown last fall. Owing to the freezing and thawing in February they all suffered, and were a much lighter crop than the previous year; but the summer and harvest being dryer and hotter than that of 1890, the berry of both fall and spring wheat is much harder and brighter than the crop of that year.

Below will be found a report of the date of sowing, heading, ripening, and the yield of $\frac{1}{20}$ of an acre of each variety tested.

In this connection I wish to explain that owing to lack of barn accommodation our grain had to be stacked, and in this climate, where there is so much wet weather, especially in autumn, the grain in small stacks gets damp and it is difficult to thresh. This entails a loss, which in small plots materially reduces the yield.

Variety.	Sown.	Headed.	Harvested.	Length of Straw.	Yield.	No. of Days to Mature.	Remarks.
				Feet.	Lbs		
Carter's Hybrid A.	Oct. 30	June 10	July 25	4½	46½	268	Straw rather soft; did not stand up well; no smut.
do B.	do 30	do 13	Aug. 3	4 to 5	45¼	277	Straw bright and standing up well; very little smut.
do C.	do 30	do 7	July 25	3½ to 4	39½	268	Straw short and soft; badly crinkled down; very little smut.
do D.	do 30	do 11	do 25	4½ to 5½	43¾	268	Straw stood up fairly well. No smut.
do E.	do 30	do 7	Aug. 10	5 to 5½	21½	284	This variety was sown in the spring of 1890, and did not ripen. We saved a few heads, and sowed it in the fall of 1890, but had not enough to sow the $\frac{1}{20}$ of an acre. I give the produce of 2½ lbs. This appears to be one of the best of Carter's Hybrids, although the grain is very small.
do F.	do 30	do 8	July 27	5 to 5½	35½	270	Straw crinkled down; a little smut.
do G.	do 30	do 3	do 25	5	55¾	268	Straw bright and fairly stiff; standing up well; no smut.
do H.	do 30	do 13	do 27	5 to 6	63¾	270	Straw stands up well; no smut.
do J.	do 30	do 9	Aug. 3	5 to 5½	49¾	277	Straw stands up fairly well; no smut.
do K.	do 30	do 14	do 3	5 to 5½	62½	277	Stands up well; straw bright and stiff; no smut.
Democrat	do 30	do 7	July 25	4 to 4½	45	268	Straw soft; did not stand up well; considerable smut.
Tasmania	do 30	do 14	Aug. 3	4 to 5	51	277	Straw soft; all down; very smutty.
Manchester.......	do 30	do 10	do 8	4½ to 5	55	282	Straw bright, and stands up well; no smut
Velvet Chaff	do 30	do 16	do 10	4 to 5	45	284	Straw bright; stands up well; no smut.

SAUNDERS' CROSS-BRED WHEATS.

Samples consisting of 20 grains each of the following varieties were planted. Beds 10 feet long and 4 feet wide were prepared, and the cross-bred wheats were planted in rows 1 foot apart in the row and the rows 3 feet apart, one row of 10 grains of some of the well-known varieties being planted in centre of each bed for comparison.

Variety.	When Sown.	When up.	Length of Straw.	Headed out.	Ripe.	Amount Produced.	No. of Grains Sown.	No. of Grains Grew.	Remarks.
Bed No. 1.			Feet.			Oz.			
Alpha	Apr. 24	May 4	3½ to 4	July 4	Aug. 24	12½	20	15	(Alpha, 20 grains; Judket, 10 grains.) Only 17 grains of Alpha germinated, and two of these, when headed out, proved to be a different variety, being strongly bearded. The Alpha is bald.
Bearded Alpha	do 24	do 4	4	do 4	do 24	1¾	..	2	Alpha stooled well; heads medium length, and fairly compact; berry bright, clear amber; medium long, but not plump; no smut. The bearded variety made a vigorous growth; straw long, bright and harder than the bald or Judket, which was in the same bed.
Judket	do 24	do 4	4½	do 6	do 27	5	10	8	Judket—8 kernels germinated; straw long, coarse and soft; laying down badly; heads long and very open, the breasts being very far apart.
Bed No. 2.									
Abundance	do 24	do 4	3 to 3½	do 5	do 23	4¾	20	9	(Abundance, 20 grs.; Rio Grande, 10 grs.) Abundance—15 grains of this variety grew, but later on 6 were cut off by worms, leaving 9 to come to maturity. This variety did not stool out well, and the heads were very uneven in length; some were over 5 inches long, but not well filled; some of the heads were much shorter, but better filled. Straw fairly bright and stiff, standing up very well. Grain bright and clear, and a much plumper berry than Alpha.
Rio Grande	do 24	do 4	3	do 7	do 20	1¼	10	3	Rio Grande—Only 3 feeble plants came to maturity, the cut-worms taking all the others, and injuring those left.
Bed No. 3.									
Beta	do 24	do 4	3½	do 5	do 28	10½	20	13	(Beta, 20 grains; Red Fife, 10 grains.) Beta—All the grains of this variety germinated, but 7 were destroyed by cut-worms. Straw bright and stiff; medium in length; stooled fairly well; heads medium in length; compact and well filled to tips with bright, plump berries of medium size.
Red Fife	do 24	do 4	2½ to 3	do 9	do 28	3¾	10	7	Red Fife—All the grains of this variety germinated; 3 were taken by cut-worms; straw medium in length; bright and hard; standing up well; heads compact; of medium length; well filled.
Bed No. 4.									
Ottawa	do 24	do 4	4	do 9	do 26	6¾	20	10	(Ottawa, 20 grs.; Anglo Canadian, 10 grs.) Ottawa—15 grains of this variety germinated, but only 10 reached maturity; straw long, but rather weak, laying down before heading out, and did not fill well; stooled well; heads medium in length and compact, but not filled out; grain small but plump.

SAUNDERS' CROSS-BRED WHEATS—*Concluded.*

Variety.	When Sown.	When up.	Length of Straw.	Headed out.	Ripe.	Amount Produced.	No. of Grains sown.	No. of Grains grew.	Remarks.
Bed No. 4—Con.			Feet.			Ozs.			
Anglo Canadian.	Apr. 24	May 4	4½	July15	Sept. 3.	8¼	10	9	Anglo Canadian—10 grains of this variety germinated and 9 came to maturity; straw long and soft; all down before heads were filled; heads long and very open, but fairly well filled out to tips; berry long but not plump.
Bed No. 5.									(Carleton, 20 grains; Ladoga, 10 grains.)
Carleton........	do 24	do 4	3 to 3½	do 6	Aug. 20	11½	20	11	Carleton, 13 grains of this variety came up but only 11 reached maturity. Headed out seven days before Ladoga, which was sown with it, and kept in the lead, ripening six days before that variety. Straw medium length and stood up well. Heads medium and well filled out. Grain plump, bright and fairly hard. A promising variety.
Ladoga.........	do 24	do 4	3½ to 4	do 13	do 26	3¼	10	4	Ladoga—6 grains of this variety germinated; only 4 matured. Straw long, and stood up well. Heads good length and fairly compact. Considerable smut. This was the only one of the twelve varieties in this test that had any smut. None were treated in any way for smut.
Bed No. 6.									(Prince, 20 grs.; White Russian, 10 grs.)
Prince..........	do 24	do 4	3 to 3½	do 6	do 27	3¼	20	6	Prince—This variety did not germinate well, only 10 grains coming up, and only 6 came to maturity. Straw long; stood up well. Heads long and very well filled. Grain medium in size, but somewhat shrunken.
White Russian..	do 24	do 4	3 to 3½	do 12	do 29	2¼	10	4	White Russian—6 grains of this variety germinated, but only 4 came to maturity. Straw medium in length and stood up well. Heads long, but very open.

WHEAT, BARLEY AND OATS, ONE-TWENTIETH OF AN ACRE PLOTS.

Tests of one-twentieth of an acre plots of wheat, oats and barley. The land chosen for these tests was ploughed for the first time in July, 1890. There was a number of fir trees grubbed out of this piece, and considerable levelling done which brought the subsoil to the surface in many places, and although the ground was ploughed twice afterwards and thoroughly worked up with the disc and drag harrows the yield was considerably reduced. None of the varieties made vigorous growth where the stumps had been or where knolls had been levelled off. The soil was a clay loam, and in every respect, except as above mentioned, all the plots were alike.

The plots of wheat were sown at the rate of 90 lbs., or 1½ bush. per acre; barley 96 lbs., or 2 bush. per acre, and oats 85 lbs., or 2½ bush. per acre. Following will be found a record of the date of sowing, heading and ripening, with other notes as to conditions of growth, &c.

Although the seed was not treated for smut there was very little in this series of test plots. Those that suffered most from inequality in the soil caused by the grubbing and levelling are marked by a star.

WHEAT.

Variety.	Sown.	Headed.	Mature.	Harvested	Weight.	Yield per Acre.		Length of Straw.	No. of Days to Mature.	Remarks.
					Lbs.	Bush.	lbs.	Feet.		
Plot No. 1, Anglo Canadian...	April 17..	July 7..	Aug. 20..	Aug. 20..	62½	20	50	3½ to 4½	125	Heads long but very open; stands up well; stools fairly well; no smut.
Plot No. 2, Ladoga...............	do 17..	June 28..	do 15.	do 15..	55	18	20	2½ to 4	119	Heads short and compact; straw very uneven in length; did not stool well; stands up well; no smut.
Plot No. 3, White Fife............	do 17..	do 29..	do 18..	do 18..	63½	21	10	3 to 3½	123	Heads long and medium compact; well filled out to tip; did not stool; straw stiff and stands up well; no smut.
Plot No. 4, Red Fife..............	do 17	do 29..	do 18..	do 18..	65	21	40	3 to 3½	123	Heads good length and compact; well filled out to tips; stands up well; stools fairly; no smut.
Plot No. 5, Campbell's Triumph...	do 17..	do 27..	do 15..	do 15..	71	23	40	3½ to 4½	119	Heads medium in length and compactness; stooled well; stands up well; no smut.
Plot No. 6, Campbell's White Chaff	do 17..	do 27..	do 13..	do 13..	63½	21	10	4½ to 5	117	Heads good length and fairly compact; stands up well; no smut.
Plot No. 7, Russian Hard Tag.....	do 17..	do 29..	do 18..	do 18..	55	18	20	3 to 4	123	Heads and straw very uneven in length; heads fairly compact; does not stand up well; a little smut.
Plot No. 8, Rio Grande	do 17..	do 28..	do 20..	do 20..	68	22	40	4½ to 5	125	Heads long but open; straw bright and stiff; a very little smut.
Plot No. 9, Judket.......	do 17..	do 30..	do 19..	do 19..	62½	20	50	3½ to 4	124	Heads medium in length but not compact; straw hard and stiff; no smut.
Plot No. 10, Red Fern	do 17..	do 30..	do 18..	do 18..	55½	18	30	2½ to 3½	123	Very uneven in length of head; fairly compact; no smut.
Plot No. 11, Indian Hard Calcutta.	do 17..	do 15..	do 10..	do 10..	30½	10	10	2 to 3	115	Did not stool; heads very short and open; a poor stand.

WHEAT.

Variety.	Sown.	Headed.	Mature.	Harvested.	Weight.	Yield per Acre.		Length of Straw.	No. of Days to Mature.	Remarks.
					Lbs.	Bush.	lbs.	Feet.		
Plot No. 12, Colorado	April 17	July 6	Aug. 15	Aug. 15	43½	14	30	2½ to 3½	120	Very poor stand; seed did not germinate well, and it did not stool; head short and open; no smut.
Plot No. 13, Pringle's Champlain	do 17	June 30	do 18	do 18	46	15	20	3½ to 4	123	Did not stool, and very uneven in length of head, ranging from medium to very short; fairly compact; no smut; straw soft.
Plot No. 14, Gehun	do 17	do 27	do 15	do 15	41	13	40	2 to 3	120	A very poor stand, and short in head and straw; heads fairly compact; straw bright and hard; no smut.
Plot No. 15, Australian	do 17	do 29	do 18	do 18	67	22	20	4½ to 5	123	Heads long and compact; straw weak; five per cent smut. This is the smuttiest wheat grown here this season.
Plot No. 16, White Russian	do 17	do 30	do 18	do 18	73	24	20	3 to 4½	123	Uneven in growth of straw and heads, but stooled well; heads rather open; stands up well; no smut.
Plot No. 17, White Delhi	do 17	do 30	do 20	do 20	64	21	20	3 to 4	125	Very uneven in growth of heads, ranging from long to very short and very open; straw bright and hard.
Plot No. 18, Saxonka	do 17	do 29	do 18	do 18	59½	19	50	3 to 4½	123	Stooled out very well; heads short and compact, but not well filled out; straw soft, and crinkled down; no smut.
Plot No. 19, White Connell	do 17	do 30	do 18	do 18	65½	21	50	3 to 4	123	Considerable levelling had been done on this plot, and the stand was poor; did not stool; heads medium in length, and compact; no smut.
Plot No. 20, Defiance	May 25	July 13	Sept. 9	Sept. 9	39¼	13	05	3½ to 4½	107	The seed for this plot and No. 21 was not received in time to sow at the time the others were sown, and the rains in autumn injured the crop; heads good length; straw bright and hard; no smut.
Plot No. 21, Wellman's Fife	do 25	do 20	do 9	do 9	34	11	20	4½ to 5	107	Heads long and fairly compact; straw bright and stiff; as in plot No. 20, this suffered from the rains in harvesting, losing over half the grain by shelling and sprouting.

BARLEY.

Two-rowed.									
Plot No. 22, Golden Melon	April 18 .	July 1..	Aug. 14..	Aug. 14..	86½	36 02	3 to 3½	118	Stands up fairly well, but not an even crop either in heads or straw; no smut.
Plot No. 23, Saale.	do 18..	do 4..	do 14..	do 14..	80½	33 26	3 to 3½	118	Straw a little weak; heads medium; no smut.
Plot No. 24, Prize Prolific.........	do 18..	do 4..	do 14..	do 14..	78¾	32 39	3 to 3½	118	Did not stool well; a thin stand and heads short; no smut.
Plot No. 25, Thanet...............	do 18..	do 2..	do 6..	do 6..	57¾	24 03	2½ to 3	106	Straw short and soft; did not stool out; heads short.
Plot No. 26, Duck-bill.	do 18..	do 2..	do 14..	do 14..	58½	24 08	2½ to 3	118	Straw stiff, and heads very fine, but crop injured as explained above.*
Plot No. 27, Kinver...............	do 18..	do 5..	do 16..	do 16..	50	20 40	2 to 3	120	Straw very uneven in length and short heads; did not stool.
Plot No. 28, Peerless White..... .	do 18..	do 2..	do 10..	do 10..	69½	28 46	2 to 3½	114	Very uneven in length of straw and head, ranging from very short to very long; straw weak.*
Plot No. 29, Improved Chevalier...	do 18..	do 4..	do 14..	do 14..	79	32 44	3 to 3½	118	Fairly even crop; straw stands up fairly well.
Plot No. 30, Danish Chevalier.. ...	do 18..	do 1..	do 10..	do 10..	81	33 36	2½ to 3½	114	Very patchy and uneven; a portion of plot very fine; crinkled down pretty badly*.
Plot No. 31, Goldthorpe.....	do 18..	do 2 .	do 14..	do 14..	101	42 04	4 to 4½	118	Very fine in spots; straw long, and stands up well; heads long and fine.*
Plot No. 32, Golden Grains.......	do 18..	do 2..	do 8..	do 8..	66½	27 34	3 to 4	112	Uneven in length of straw and head; straw stiff.
Six-rowed.									
Plot No. 33, Baxter's Six-rowed....	do 20..	June 18..	July 27..	July 30..	90	37 24	3 to 3½	98	Straw bright and hard, standing up well; well stooled out and even; no smut.
Plot No. 34, Rennie's Improved....	do 20..	do 18..	do 24..	do 25..	86½	36 02	3 to 3½	92	Straw medium stiff, standing; standing up fairly well; well stooled; fully 3 per cent smut.
Plot No. 35, Odessa................	do 20..	do 19..	Aug. 7..	Aug. 10..	75¼	31 17	2 to 3½	109	Very uneven in length of straw and head; did not stool, and made a thin stand; very little smut.
Plot No. 36, Oderbruch............	do 20..	June 22..	July 27..	July 31..	54¾	22 39	2 to 3½	98	Straw soft and weak, lying down when ripe; very patchy.*
Plot No. 37, Common Six-rowed....	May 6..	July 2..	Aug. 18..	Aug. 18..	137½	57 14	3 to 3½	105	The seed of this plot was procured from Mr. Robert Carson, of Pavillion Mountain, 3,000 ft. above sea level. It was an extra fine stand, straw standing up well and very even, with extra long heads; no smut.
Plot No. 38, Six-rowed wheat.... .	April 20..	June 25..	July 30..	do 1..	100½	41 42	2½ to 3	100	Stand even, and straw bright and stiff; heads long and well filled.
Plot No. 39, Mensury.............	do 20..	do 19..	do 30..	do 1..	86	35 40	2 to 2½	100	Stands up well; did not stool, and is not an even crop; heads very uneven; a little smut.
Plot No. 40, Spiti Valley..........	do 20..	do 13..	do 24..	July 25..	54	20 24	1 to 1½	95	Seed did not germinate well, but where it did grow it stooled out well; straw was very short.

OATS.

Variety.	Sown.	Headed.	Mature.	Harvested.	Weight.	Yield per Acre. Bush.	Yield per Acre. lbs.	Length of Straw.	No. of Days to Mature.	Remarks.
					Lbs.	Bush.	lbs.	Feet.		
Plot No. 41, Black Tartarian	April 20	June 15	Aug. 21	Aug. 22	93	54	24	2 to 2½	123	Stands up well, but very poor stand; seed did not germinate well; no smut.
Plot No. 42, Bonanza	do 20	July 6	do 18	do 19	64	37	22	3 to 3½	120	Straw soft, and badly down when ripe; heads short and not well filled; no smut.
Plot No. 43, Canadian Triumph	do 20	do 10	do 17	do 18	46	27	2	2½ to 3	119	Very thin stand; did not stool; heads very short; no smut.
Plot No. 44, Egyptian	do 20	do 14	do 20	do 22	80½	47	12	2 to 3½	122	Straw hard and bright, standing up well, and well headed, but very uneven in growth; no smut.
Plot No. 45, Challenge	do 20	do 11	do 20	do 22	62½	36	26	3 to 3½	122	Stands up pretty well, but a very poor stand; seed did not germinate well; no smut.
Plot No. 46, Prolific Black Tartarian	do 20	do 15	do 21	do 22	82	48	8	2½ to 3½	123	Very uneven in length of straw and head; stands up well; no smut.*
Plot No. 47, Banner	do 20	do 11	do 22	do 22	124	73	32	3½ to 4½	124	Stands up well; long, well-filled heads of plump grain; no smut.
Plot No. 48, Early Blossom	do 20	do 6	do 17	do 19	87	51	6	3 to 5	119	Considerably broken down; straw soft; no smut.*
Plot No. 49, Early Racehorse	do 20	do 8	do 16	do 19	90½	53	8	4½ to 5½	118	Straw long and coarse, but soft, and fell down before ripe; no smut.
Plot No. 50, Flying Scotchman	do 20	do 9	do 18	do 19	99	58	8	3½ to 4½	120	Did not stand up well, but well headed, and grain plump; a little smut.
Plot No. 51, Giant Swedish	do 20	do 16	do 22	do 22	82½	48	18	3 to 3½	124	Stands up well; straw strong and bright; no smut.
Plot No. 52, White Poland	do 20	do 8	do 18	do 19	63½	37	12	2 to 4	121	Very uneven in straw and head; does not stand up well; a little smut.*
Plot No. 53, Prize Cluster	do 20	do 9	do 16	do 19	49	28	28	2 to 2½	118	Straw short and heads poor; no smut.
Plot No. 54, Rennie's Prize	do 20	do 11	do 19	do 19	41½	24	14	2 to 2½	121	Very poor in straw and head; seed did not germinate well; a very poor stand.*
Plot No. 55, Victoria Prize White	do 20	do 12	do 21	do 22	44	25	30	2½ to 3½	123	Stands up well; heads short and very open; no smut.
Plot No. 56, White Russian	do 20	do 15	do 19	do 19	60	35	10	2½ to 3½	121	Straw soft; lodged when cut; heads short but compact; no smut.
Plot No. 57, Early Archangel	do 20	do 10	do 18	do 19	73½	43	8	3½ to 4	120	Stands up well; heads long and compact, but seed did not germinate freely, and did not stool out.
Plot No. 58, Holstein Prolific	do 20	do 13	do 20	do 21	76½	45	0	3½ to 4	123	Straw bright and hard; heads short but compact; a poor stand.*
Plot No. 59, Rosedale	do 20	do 16	do 18	do 19	95⅓	56	4	4 to 5	120	Straw soft, and crinkles down; heads long and compact; a poor stand.

Plot No. 60, Hazlett's Seizure	do	20..	do	10..	do	18..	do	19..	72	42	18	3½ to 4	120	Straw bright, and stands up well; did not stool out; very thin stand, but fine compact heads; no smut.*
Plot No. 61, Welcome	do	20..	do	9..	do	17..	do	17..	66	38	28	3½ to 4	119	Straw bright and stiff, standing up well; a little smut.
Plot No. 62, American Triumph ...	do	20..	do	18..	do	17..	do	17..	67½	39	24	3 to 3½	119	Straw bright, and stands up well; no smut.
Plot No. 63, Early Gothland	do	20..	do	12..	do	15..	do	17..	50	58	28	4 to 4½	117	There was only 2 lbs. of this variety sown on half a plot, or one-fortieth of an acre. Stands up well; good, long, well-filled heads; bright, plump grain.
Plot No. 64, Golden Side	do	20..	do	18..	do	19..	do	22..	67½	39	24	3½ to 4	121	Stands up well, but heads short and not well filled out. Not a desirable oat.

EARLY AND LATE TESTS OF ONE-TWENTIETH OF AN ACRE OF WHEAT, BARLEY AND OATS.

The land for these tests had been first broken up in the fall of 1889 and cropped with grain in 1890; it was ploughed in the fall of 1890 and thoroughly harrowed in the spring of 1891, and the ground for each series of plots was carefully harrowed just before sowing.

The weather up to the third sowing had been very wet and cold, and the grain did not make much progress during that time.

Plot No. 6, in each case, was threshed from the stook, and the others had to be stacked. This accounts for much of the difference in yield in favour of Plot No. 6 of barley, wheat and oats.

Below will be found the date of each sowing, heading, maturing and harvesting, &c. :—

WHEAT.

Variety.	Sown	Headed.	Mature.	Harvested	Weight.	Yield Per acre.	Length of Straw.	No. of Days to Mature.	Remarks.
					Lbs.	Bush.	Ft.		
White Connell.									
Plot No. 1	April 15	June 27	Aug. 16	Aug. 17	64	21·20	3½ to 4	123	Straw strong and stands up well. Did not stool well. No smut.
do 2	do 22	July 2	do 20	do 20	60	20·00	2½ " 3½	120	Very uneven in straw and head. No smut.
do 3	do 29	do 8	do 22	do 22	49	16·20	2 " 2½	115	Very short in head and straw. A little smut.
do 4	May 6	do 14	do 24	do 24	51½	17·10	2½ " 3	110	Short in straw and head. Did not stool out. Considerable smut.
do 5	do 13	do 17	do 27	do 28	67	22·20	3 " 3½	176	Even crop. A fairly good stand. Very smutty.
do 6	do 20	do 23	Sept. 1	Sept. 1	75	25·00	3½ " 4	104	Straw soft and lodged before ripe. No smut.
Campbell's White Chaff.									
Plot No. 1	April 15	June 29	Aug. 10	Aug. 12	66½	22·10	3 to 3½	119	Straw bright and hard. Heads short but well filled out. No smut.
do 2	do 22	July 2	do 16	do 17	59½	19·50	2 " 3½	116	Stands up well, but very uneven in length of straw and head. No smut.
do 3	do 29	do 8	do 20	do 20	59½	19·50	2 " 3½	113	Very uneven in head and straw. Heads well filled. No smut.
do 4	May 6	do 13	do 22	do 22	45¼	15·50	2 " 2½	108	Straw short and head poor. A very thin stand. No smut.
do 5	do 13	do 17	do 24	do 24	56	18·40	3 " 3½	102	Straw medium. Heads long and well filled out. No smut.
do 6	do 20	do 22	do 27	do 28	81½	27·10	3½ " 4	99	Straw stiff and bright. Heads long and well filled out. No smut.

BARLEY.

Baxter's Six-rowed.									
Plot No. 1	April 15	June 25	July 24	July 25	50	20·40	2 to 2½	101	Stands up well. Considerable smut. Heads short.
do 2	do 22	do 28	Aug. 2	Aug. 3	54	22·24	2 " 2½	103	do More smut than Plot No. 1.
do 3	do 29	July 6	do 5	do 10	50	20·40	2 " 2½	99	Broken down by storm. No smut.
do 4	May 6	do 9	do 10	do 10	53	22·4	2 " 3	96	Very uneven in straw and head. Considerable smut
do 5	do 13	do 11	do 16	do 17	56	23·16	2½ " 3	95	Stands up well, very smutty.
do 6	do 20	do 16	do 20	do 22	68	28·16	3 " 3½	92	do Medium long heads. A little smut.
Prize Prolific Barley.									
Plot No. 1	April 15	July 2	Aug. 10	Aug. 11	56½	23·26	2 to 2½	118	Straw stiff, but crop very thin. Heads medium. No smut.
do 2	do 22	do 10	do 15	do 17	57½	23·46	2 " 3	116	Straw uneven in length, but stands up. No smut.
do 3	do 29	do 13	do 17	do 17	56	23·16	2 " 2½	111	Stands up, but a light crop. Heads medium. No smut.
do 4	May 6	do 17	do 20	do 20	55	22·44	2 " 2½	106	Very thin stand. Heads long and filled out. No smut.
do 5	do 13	do 18	do 22	do 22	70	29·8	2½ " 3	101	Stooled very well, but heads poor.
do 6	do 20	do 22	do 30	Sept. 1	75	31·12	3½ " 4	102	Straw soft and badly lodged. Stooled well, but did not fill out well. No smut.

OATS.

Prize Cluster.									
Plot No. 1	April 15	July 3	Aug. 10	Aug. 10	65½	38·18	3½ to 00	117	Stands up well. Heads short. No smut.
do 2	do 22	do 8	do 16	do 17	68	40·0	3½ " 4	116	Straw bright and stiff. Heads only medium. No smut.
do 3	do 29	do 12	do 17	do 17	64	37·22	3 " 3½	110	Did not stool out, but straw stands up well. No smut.
do 4	May 6	do 14	do 20	do 20	55½	32·22	2 " 2½	106	Heads short and stand very thin. No smut.
do 5	do 13	do 18	do 22	do 22	70	41·6	3 " 3½	101	Stands up well. Grain plump and fairly long heads. No smut.
do 6	do 20	do 23	do 27	do 29	80	47·2	3½ " 4	99	Stands up well. No smut.
American Banner.									
Plot No. 1	April 15	July 8	Aug. 12	Aug. 12	73½	43·8	3 to 3½	119	Stands up well. No smut.
do 2	do 22	do 11	do 17	do 17	81½	47·32	3 " 3½	117	Straw bright and hard. No smut.
do 3	do 29	do 14	do 20	do 20	86	50·20	3½ " 4	113	do bright and stiff. No smut.
do 4	May 6	do 18	do 22	do 22	67	39·14	2½ " 3	109	do short and stand very thin. No smut.
do 5	do 13	do 24	do 28	do 29	76	44·24	3 " 3½	107	do strong and bright. Did not stool out. No smut.
do 6	do 20	do 29	do 31	Sept. 1	112½	66·6	3½ " 4	103	do strong and bright. Stands up well. No smut

CORN.

Variety.	Planted.	Up.	Tasselled.	Early Milk.	Late Milk.	Height.	Cut.	Weight.		Remarks.
						Feet.		Tons.	Lbs.	
Blunt's Prolific	May 22	June 1	Aug. 28			14	Oct. 13			Corn did not form.
Weight in hills per acre								27	1845	
do drills do								27	1467	
Golden Dent	May 22	June 1	Aug. 29			13	Oct. 13			Ears formed, but did not come to early milk
Weight in hills per acre								24	1912½	
do drills do								23	1905	
Chester Co. Mammoth	May 22	June 4	Aug. 24			13	Oct. 13			Ears formed, but no corn; very green when cut.
Weight in hills per acre								24	601¼	
do drills do								24	464	
Virginia Horse Tooth	May 22	June 3	Aug. 26			10	Oct. 13			Ears formed; no corn; very green when cut.
Weight in hills per acre								19	1930	
do drills do								20	1937½	
Golden Beauty	May 22	June 5	Aug. 26	Roasting ears. Oct. 11		11½	Oct. 13			Ears in good roasting condition when cut.
Weight in hills per acre								23	1038¾	
do drills do								21	1367½	
Red Cob Ensilage	May 22	June 2	Aug. 22	Sept. 20	Oct. 12	10	Oct. 13			Beginning to glaze when cut.
Weight in hills per acre								22	1828¾	
do drills do								21	762½	
Mammoth Southern Sweet	May 23	June 4	Aug. 16			11	Oct. 13			Ears formed, but not to early milk; stalks slender.
Weight in hills per acre								19	417	
do drills do								18	1400	
Giant P. E. Sweet	May 23	June 4	Aug. 26			12	Oct. 13			Ears just formed; very green when cut.
Weight in hills per acre								22	131¼	
do drills do								21	927½	
Salzer's Superior Fodder	May 23	June 3	Aug. 23			11	Oct. 13			Not in early milk when cut.
Weight in hills per acre								19	1266	
do drills do								18	1537½	
King Philip	May 23	June 3	Aug. 15	Sept. 20	Oct. 10	8	Oct. 13			Good condition; corn nearly all glazed.
Weight in hills per acre								13	771¼	
do drills do								12	1877½	
Longfellow	May 23	June 4	Aug. 14	Sept. 11	Oct. 3	8	Oct. 13			Good condition; corn glazed; ears well formed, and filled out to tips.
Weight in hills per acre								12	1107½	
do drills do								11	1595½	
Long White Flint (Steele Bros)	May 23	June 3	Aug. 6	Sept. 20	Oct. 11	8½	Oct. 13			Good condition; commencing to glaze; ears large and well filled to tips.
Weight in hills per acre								15	89¾	
do drills do								14	572½	

Long Yellow Flint (Dakota)	May 23	June 4	Aug. 9	Sept. 20	Oct. 6	8½	Oct. 13			Late milk when cut; ears large, but not well filled out to tip.
Weight in hills per acre								15	1308¾	
do drills do								13	1802½	
Thoroughbred White Flint	May 23	June 4	Aug. 18			10	Oct. 13			Nearly in roasting ear when cut; stalk rather coarse.
Weight in hills per acre								20	1593¾	
do drills do								19	170	
Livingstone's Gold Coin	May 23	June 2	Aug. 26			7	Oct. 13			Very early milk when cut; not to roasting stage.
Weight in hills per acre								13	1830	
do drills do								14	352½	
Canada Yellow	May 23	June 3	Aug. 2	Sept. 18	Oct. 13	7	Oct. 13			Good condition; glazed; ears medium long and well filled out.
Weight in hills per acre								12	1107½	
do drills do								11	1952½	
Pearce's Prolific	May 23	June 4	Aug. 3	Sept. 2	Sept. 22	8	Oct. 13			Some ears ripe, remainder glazed; ears medium long and well filled to tip; one of the best.
Weight in hills per acre								12	525	
do drills do								11	1980	
Mitchell's Early	May 23	June 3	July 27	Aug. 17	Sept. 15	5½	Oct. 13			Ripe Oct. 1; ears small and not well filled out to tip.
Weight in hills per acre								7	1073¾	
do drills do								6	575	
Red Blazed	May 23	June 4	July 27	Aug. 19	Oct. 1	7½	Oct. 13			Ripe Oct. 13; ears medium long, well filled to tip; several vacant spots, where trees had been taken out the previous fall.
Weight in hills per acre								9	1360	
do drills do								8	197½	
White Flint (from Dakota)	May 23	June 3	July 28	Sept. 11	Oct. 11	5	Oct. 13			Corn short and stalks slender; ears very small.
Weight in hills per acre								4	1326¼	
do drills do								4	1460	
Yellow Flint (from Dakota)	May 23	June 3	July 27	Sept. 4	Oct. 6	5½	Oct. 13			Glazed; ears medium and well filled.
Weight in hills per acre								10	570	
do drills do								7	272½	
North Dakota	May 23	June 4	July 30	Sept. 8	Oct. 8	6	Oct. 13			Glazed; ears medium; well filled out to tips.
Weight in hills per acre								10	1175	
do drills do								7	1042½	
Dakota Gold Coin	May 23	June 3	Aug. 6	Sept. 17		6½	Oct. 13			Roasting ears when cut; ears medium large, but not very well filled out to tips.
Weight in hills per acre								11	1897½	
do drills do								11	110	
Large Eight-rowed	May 23	June 7	Aug. 3	Sept. 27		8	Oct. 13			Roasting ears when cut; ears short but thick, and well filled.
Weight in hills per acre								19	115	
do drills do								18	190	
Egyptian	May 23	June 6	Aug. 11	Oct. 1		10	Oct. 13			Large, well-formed ears, but not good roasting ears when cut.
Weight in hills per acre								19	115	
do drills do								17	1860	
Extra Early Cory	May 23	June 8	July 14	Aug. 7	Aug. 27	4½	Oct. 13			Good roasting ears Aug. 10; ears well filled to tip.
Weight in hills per acre								4	772½	
do drills do								4	1157½	
Pee and Kay	May 25	June 5	Aug. 4	Sept. 4	Oct. 4	10½	Oct. 13			Roasting ears when cut; did not germinate well.
Weight in hills per acre								10	1628¾	
do drills do								11	1650	
Early Mammoth	May 25	June 5	Aug. 11	Sept. 22		10½	Oct. 13			Roasting ears when cut; stalks slender; ears good size, but not well filled to tips.
Weight in hills per acre								16	972½	
do drills do								14	902½	
Asylum	May 25	June 8	Aug. 9	Sept. 1	Sept. 24	11½	Oct. 13			Glazed Oct. 4; ears long and well filled.
Weight in hills per acre								17	1846½	
do drills do								15	1212½	

CORN—*Concluded.*

Variety.	Planted.	Up.	Tasselled.	Early Milk.	Late Milk.	Height.	Cut.	Weight.		Remarks.
						Feet.		Tons.	Lbs.	
Potter's Excelsior	May 25	June 8	Aug. 17	Sept. 20	Roasting, Oct. 1	12	Oct. 13			Nearly glazed when cut; ears medium and fairly well filled out to tip.
Weight in hills per acre								19	1325	
do drills do								20	1580	
White Flint (Dakota)	May 25	June 8	July 25	Aug. 29	Sept. 29	7	Oct. 13			Glazed when cut; ears medium long, but slender; not well filled to tip.
Weight in hills per acre								10	570	
do drills do								9	1360	
Stowell's Evergreen	May 25	June 10	Aug. 17	Sept. 30	Roasting, Oct. 12	13½	Oct. 13			Roasting ear when cut; ears large and fair length, but poorly filled.
Weight in hills per acre								23	1975	
do drills do								20	480	
Cinquantine										Did not germinate.

CORN.

This has been a very favourable season for corn; there was sufficient moisture, and more than the usual amount of summer heat. There were thirty-three varieties tested, both in hills and drills. The hills were planted 3 feet apart each way, and four plants to a hill; the drills were 3 feet apart, and the plants about 6 inches apart in the row. All made a strong growth, except the Cinquantine, which did not germinate. Quite a number of the early varieties ripened corn. This was the second crop on the land, and all were treated alike—clean cultivation, without any fertilizer. The corn that was glazed was husked, and kept for chicken feed, but was too much mixed to be of use for seed.

Above is the weight of each variety, with other particulars as to date of planting, tasselling, &c.

PEASE AND TARES.

One variety of tares and five of field pease have been tested. Six pounds of seed of each variety were sown. All were sown broadcast. Soil, gravelly loam; first broken fall of 1889; produced a crop of roots in 1890. The yield, as will be seen, is an extraordinary one. The area sown, date of sowing and yield is as follows:—

Variety.	When Sown.	No. of Lbs. Sown.	Rate per Acre Sown.	Area Sown.	Harvested.	Yield.	Yield per Acre.		No. of Days to Mature.
			Lbs.	Acres.		Lbs.	Bush.	lbs.	
White tares	April 28....	6	90	$\frac{1}{15}$	August 28..	282	70	30	140
Crown pease........	do 28....	6	150	$\frac{1}{25}$	do 20..	279	116	15	132
Prussian Blue.......	do 28....	6	150	$\frac{1}{25}$	do 20..	269½	112	17½	132
Mummy............	do 28....	6	150	$\frac{1}{25}$	do 28..	309¼	128	51¼	140
Prince Albert.......	do 28....	6	150	$\frac{1}{25}$	do 20..	277	115	25	132
White Marrowfat....	do 28....	6	180	$\frac{1}{30}$	do 21..	210	105	00	133

LATHYRUS SYLVESTRIS WAGNERI.

One hundred plants of this new fodder plant were received and planted in the fall of 1890. Only about 60 plants lived through the winter, owing to the heaving of the ground, but these made a strong, vigorous growth and fruited this year, and the plants being now thoroughly rooted are not likely to suffer from frost this winter. Owing to the scarcity of the plant and seed, it was thought best to leave ours to mature the seed, and we have now about 20 ounces of seed.

The straw was still green and succulent when the seed was harvested, and we cut it and offered some to our cattle and horses, but they would not eat it, and we were unable to cure it owing to continued rainy weather. Next year it is proposed to try it in a silo. If it makes good ensilage it will be valuable on account of the large quantity which can be taken off the land. The vines this year averaged from 4 to 6½ feet in length.

TURNIPS.

Fourteen varieties of turnips were sown, two sowings of each sort being made, the first on 29th May and the second on 12th June. The soil was a sandy loam, which had been seeded to timothy many years since, but was grown up to brush and weeds. Ploughed in the fall of 1889 and cropped in 1890; ploughed again in the fall of 1890, and thoroughly harrowed before seeding last spring. This land has had no manure. The turnips were sown in drills 30 inches apart and kept

clean, all being treated alike. There were no extra-large roots, but a fair average size over all, and uniformly smooth. The following is the result in each case:—

Variety.	Sown.	Harvested.	Weight per Acre.		Yield per Acre.	
			Tons.	lbs.	Bush.	lbs.
Highland Prize (Simmers)	May 29	Nov. 11	32	1,002	1,083	22
	June 12	do 11	28	1,684	961	24
Hartley's Bronze Top (Pearce)	May 29	do 11	26	96	868	16
	June 12	do 11	20	975	682	55
Elephant (Bruce)	May 29	do 11	35	400	1,173	20
	June 12	do 11	26	1,592	893	12
Elephant (Pearce)	May 29	do 11	36	512	1,208	32
	June 12	do 11	26	1,328	888	48
Selected Purple Top (Steele)	May 29	do 11	48	448	1,607	28
	June 12	do 11	35	400	1,173	20
Clyde Improved (Evans)	May 29	do 11	38	1,616	1,293	36
	June 12	do 11	28	788	946	28
Imperial Swede (Webb)	May 29	do 11	36	600	1,210	00
	June 12	do 11	26	624	877	04
Giant King (Webb)	May 29	do 11	32	1,064	1,084	24
	June 12	do 11	27	472	907	52
Mammoth Purple Top (Evans)	May 29	do 11	49	1,440	1,657	20
	June 12	do 11	34	992	1,149	52
Elephant (Steele)	May 29	do 11	35	1,623	1,193	43
	June 12	do 11	33	1,854	1,130	54
Marquis of Lorne (Bruce)	May 29	do 12	34	1,784	1,163	04
	June 12	do 12	32	1,208	1,086	48
Skirving's Improved (Steele	May 29	do 12	36	1,128	1,218	48
	June 12	do 12	30	1,072	1,017	52
Prize Purple Top (Rennie)	May 29	do 12	40	1,136	1,352	16
	June 12	do 12	30	1,424	1,023	44
Bangholm (Simmers)	May 29	do 12	33	704	1,111	44
	June 12	do 13	29	1,840	997	20

These weights show a marked difference in each case in favour of early sowing.

MANGELS.

Fourteen varieties of mangels were sown, in drills $2\frac{1}{2}$ feet apart. The land selected for this test was a sandy loam of uniform quality and condition. It received a light dressing of stable manure in the spring of 1890, followed by a hoed crop. Was ploughed in the fall of 1890, and well harrowed previous to sowing last spring. All were treated alike in every respect.

A second sowing of each variety was made two weeks after the first.

Although there was a short drought in mid-summer, yet the season was a favourable one for root crops.

The results in this case indicate that for this season, although the crop was heavy, the first sowing was too early. It is probable that the cold, wet weather of early spring injured the seed first sown.

Variety.	Sown.	Harvested.	Weight per Acre.		Yield per Acre.	
			Tons.	lbs.	Bush.	lbs.
Long Red (Steele)	April 9	Nov. 13	45	1,232	1,520	32
	do 23	do 13	48	1,328	1,622	08
Long Red (Simmers)	do 9	do 13	45	904	1,515	04
	do 23	do 13	50	1,376	1,689	36
Yellow Intermediate (Steele)	do 9	do 13	39	1,200	1,320	00
	do 23	do 13	37	976	1,249	36
Canadian Giant (Pearce)	do 9	do 13	43	196	1,436	36
	do 23	do 13	50	276	1,671	16
Long Red (Rennie)	do 9	do 13	49	208	1,636	48
	do 23	do 13	52	720	1,745	20
New Giant Yellow (Bruce)	do 9	do 13	31	900	1,048	20
	do 23	do 13	26	800	880	00
Gate Post (Bruce)	do 9	do 14	51	960	1,716	00
	do 23	do 14	57	1,632	1,927	12
Carter's Warden (Bruce)	do 9	do 14	48	800	1,613	20
	do 23	do 14	44	1,408	1,490	8
Yellow Globe (Rennie)	do 9	do 14	69	862	2,314	22
	do 23	do 14	61	144	2,035	44
Golden Tankard (Evans)	do 17	do 14	52	1,776	1,762	56
	do 29	do 14	52	1,248	1,754	18
Mammoth Long Red (Evans)	do 17	do 14	51	1,488	1,724	48
	do 29	do 14	52	896	1,748	16
Mammoth Long Red (Webb)	May 8	do 14	61	232	2,037	12
	do 22	do 14	55	1,954	1,865	54
Champion Yellow Globe (Webb)	do 8	do 14	56	376	1,872	56
	do 20	do 14	48	1,264	1,617	44
Yellow Tankard (Webb)	do 11	do 14	41	16	1,366	56
	do 25	do 14	38	566	1,276	00

CARROTS.

Fourteen varieties of carrots were sown. Two sowings of these were made in rows 1 foot 6 inches apart. Soil a sandy loam; manured in the spring of 1890 and produced a crop of potatoes. Was ploughed in the fall of 1890 and thoroughly harrowed last spring before the carrots were sown. The soil and treatment was the same in each case.

The yield of each variety is given below.

Variety.	Sown.	Harvested.	Weight per Acre.		Yield per Acre.	
			Tons.	lbs.	Bush.	lbs.
Vosges (Bruce)	April 9	Nov. 16	26	1,093	884	53
	do 23	do 16	16	1,146	552	26
Vosges (Simmers)	do 9	do 16	22	1,906	765	6
	do 23	do 16	18	1,693	628	13
Vosges (Rennie)	do 9	do 16	31	513	1,041	53
	do 23	do 16	21	1,266	721	6
Guerande (Steele)	do 9	do 16	30	1,560	1,026	00
	do 23	do 16	26	213	870	13
Guerande (Rennie)	do 9	do 16	26	1,386	889	46
	do 23	do 16	21	240	704	00
Improved Short White (Steele)	do 9	do 16	18	746	612	26
	do 23	do 16	19	1,306	655	6
Half Long Luc (Rennie)	do 9	do 16	15	1,808	530	8
	do 23	do 16	10	1,706	381	46
Green Top Orthe (Pearce)	do 9	do 16	20	1,213	686	53
	do 23	do 16	20	40	666	40

CARROTS—*Concluded.*

Variety	Sown.	Harvested.	Weight per Acre.		Yield per Acre.	
			Tons.	lbs.	Bush.	lbs.
Chantenay (Bruce)	April 9	Nov. 16	25	1,773	862	53
	do 23	do 16	15	1,533	525	33
White Intermediate (Rennie)	do 9	do 16	19	133	635	33
	do 23	do 16	20	1,800	696	40
James Intermediate (Pearce)	do 9	do 16	22	440	740	40
	do 23	do 16	15	506	508	26
Mitchell's Perfected (Pearce)	do 9	do 16	14	1,920	498	40
	do 23	do 16	15	1,385	556	25
Selected Altringham (Webb)	do 9	do 16	24	722	812	2
	do 23	do 16	16	256	537	36
Yellow Intermediate (Webb)	do 9	do 16	27	333	905	33
	do 23	do 16	20	1,444	690	44

In these also, with two or three exceptions, the results are largely in favour of early sowing.

SUGAR BEETS.

Owing to the season being well advanced when the seed was received only one sowing was made. It was sown in rows $2\frac{1}{2}$ feet apart and the plants thinned to about 5 inches in the row. The soil was a gravelly loam. The land was broken up in the fall of 1889 and planted with fodder corn in 1890, but has not had any manure. Yield per 3 rows of 66 feet:—

	Lbs.
German	455
French	515

Yield per acre:—

	Tons.	Lbs.	Bush.	Lbs.
German	19	1,640	660	40
French	22	320	755	20

The difference in yield may, perhaps, be accounted for by the French beets having been sown alongside of a row of apple trees which had received a light dressing of burned clay and ashes in the fall of 1890.

POTATOES.

There were 23 varieties of potatoes planted for testing.

The seed was cut to two eyes to the set and planted 1 foot apart in the row, and rows 3 feet apart. Two rows 90 feet long of each variety were planted. The soil, a dry sandy loam, had produced a crop of beans in 1890, and had received a light dressing of manure in the fall after the bean crop was harvested, which was thoroughly worked into the land with the disc and drag harrows.

The potatoes were planted 25th May. Each variety was tested from time to time, beginning 28th July, and the size and quality noted; also the percentage of merchantable potatoes and of rotten, if any.

Sixty-six feet of two rows of each variety was dug from 17th to 24th October, and the produce weighed. Below will be found the weight of sound and rotten potatoes of each variety; also the percentage of merchantable potatoes at each digging for testing purposes, as well as at the final digging, with note of table qualities of each variety.

POTATOES.

Variety.	Planted.	Mature.	Harvested.	Sound Tubers.	Rotten Tubers.	Total.	Yield per Acre.		Per cent Marketable at each Test.	Rotten.	Remarks.
				Lbs.	Lbs.	Lbs.	Bush.	lbs.		p. c.	
Vanguard	May 25	Sept. 14	Oct. 16	68	82½	150½	275	55	50	......	Medium growth of tops; large tubers; very rough and knotty, and uneven in size.
									40	......	First test, 28th July; soft and watery; rough and uneven.
									40	5	Second test, 5th August; quality, poor.
									40	10	Third test, 19th August; quality better, but not good.
											Fourth test, 22nd December; wet and soft when cooked; a good many rotted since digging.
Rural Blush........	May 25	Sept. 20	Oct. 16	170	35	205	375	50	75	......	Strong growth of tops; tubers of a large average size; 75 per cent marketable at digging.
									50	......	First test, 3rd August; too soft for table use.
									60	......	Second test, 17th August; good average size; quality, poor.
									70	......	Third test, 29th August; large average size; dry and fairly good for table, but many hollow in heart.
											Fourth test, 19th December; quality not as good as before digging; many turning black in centre; 25 per cent rotted since digging.
White Star.........	May 25	Sept. 24	Oct. 16	127	51	178	326	20	45	......	Medium growth of tops; tubers very knotty and uneven in size.
									25	......	First test, 8th August; flavour good, but rather soft and immature; size, medium to small.
									35	......	Second test, 24th August; improving in size and quality.
									45	25	Third test, 31st August; quality fair, but undesirable on account of rough, knotty shape.
											Fourth test, 20th December; quality, poor; a good many rotten.
Clarke's No. 1......	May 25	Sept. 19	Oct. 16	141	38	179	328	10	90	......	Medium growth of tops.
									25	......	First test, 8th August; quality, poor; size, small to medium.
									30	......	Second test, 21st August; improving in size and quality.
									80	15	Third test, 2nd September; average size; dry and mealy; good flavour.
										25	Fourth test, 21st December; medium in quality; rotting since digging.
Early Maine........	May 25	Aug. 30	Oct. 16	78½	45	123½	234	40	70	......	Medium growth of tops; tubers fair average size, but shape rough and knotty.
									20	......	First test, 28th July; too green and soft for table use; size, small average.
									35	2	Second test, 17th August; quality, fair; size, fair average.
									60	3	Third test, 2nd September; quality, good; boiled dry and mealy; fair average size.
											Fourth test, 27th December; good quality; dry and mealy when cooked; good flavour.

POTATOES.

Variety.	Planted.	Mature.	Harvested.	Sound Tubers.	Rotten Tubers.	Total.	Yield per Acre.		Per cent Market-able at each Test.	Rotten.	Remarks.
				Lbs.	Lbs.	Lbs.	Bush.	lbs.		p. c.	
Halton Seedling.....	May 25	Sept. 4	Oct. 16	$136\frac{3}{4}$	$47\frac{1}{4}$	184	337	20	70	......	Growth of tops medium strong; tubers fair average size and good shape.
									35	......	First test, 3rd August; good average size; smooth tubers; when cooked, pretty dry.
									50	2	Second test, 21st August; good average size; dry and mealy.
									55	3	Third test, 2nd September; good average size; good flavour; cooked dry and mealy.
											Fourth test, 21st December; cooked dry and mealy; keeping well.
London............	May 25	Aug. 23	Oct. 16	$106\frac{1}{4}$	$47\frac{3}{4}$	154	282	20	50	......	Feeble growth of tops; smooth, even-shaped potatoes.
									35	......	First test, 4th August; medium size and very even; cooked dry and mealy.
									40	......	Second test, 18th August; smooth, even tuber, and of average size; cooked dry.
											Third test, 4th September; fair average size; cooked dry.
											Fourth test, 22nd December; good table potato; keeping well.
Algoma	May 25	Sept. 15	Oct. 16	144	$56\frac{3}{4}$	$170\frac{3}{4}$	312	72	75	......	Growth fair; medium tops.
									35	......	First test, 11th August; poor flavour; very uneven in size.
									40	2	Second test, 20th August; very uneven in size; poor flavour.
									50	7	Third test, 14th September; not a desirable potato; flavour poor; does not cook dry; large tubers, hollow in the heart.
										25	Fourth test, 4th December; rotting rapidly at this date, and does not cook dry; a very poor potato.
Ohio Gunner........	May 25	Sept. 1	Oct. 20	$43\frac{1}{4}$	$40\frac{3}{4}$	84	154	..	40	......	Weak growth of tops; size, from large to very small; the large tubers are frequently hollow hearted.
									20	......	First test, 6th August; good flavour and pretty dry.
									25	......	Second test, 20th August; good flavour and dry, but very uneven in size.
									30	3	Third test, 13th September; dry and mealy; good flavour.
											Fourth test, 10th December; very good.
Lee' Favourite.	May 25	Sept. 10	Oct. 20	$133\frac{1}{4}$	$45\frac{1}{4}$	$183\frac{1}{2}$	336	25	75	......	Tubers, medium to large; fair growth of tops.
									60	1	First test, 2nd August; large average size; cooked dry and floury; good flavour.
									65	3	Second test, 21st August; medium to large; good flavour; dry and floury.
									75	4	Third test, 2nd October; large, good quality.
											Fourth test, 12th December; good; keeping well.
Delaware..........	May 25	Sept. 25	Oct. 20	140	$88\frac{1}{2}$	$228\frac{1}{2}$	427	15	80	......	Strong growth of tops, and even.
									30	......	First test, 7th August; tubers, small to medium, and numerous not dry or of good flavour.

									50	3	Second test, 22nd August; improving in size, but not in quality; commencing to rot.
									60	10	Third test, 15th September; not good in quality.
										25	Fourth test, December; not dry or mealy, and poor in flavour; rotting rapidly.
Rose's New Giant...	May 25	Sept. 27	Oct. 20	138½	52¾	191¼	350	37½	80	......	Strong growth of tops; tubers very uneven, rough and knotty.
									50	1	First test, 6th August; not dry; poor in quality.
									50	3	Second test, 23rd August; tubers large and soft; poor in quality.
									60	5	Third test, 20th Sept.; tubers large, rough and knotty; quality, poor.
										10	Fourth test, 31st December; cooked dry, but inferior in flavour.
Early Eating.......	May 25	Sept. 20	Oct. 20	197¾	33	230¾	423	2½	85	....	Growth of tops, fair; tubers medium in size and a large number in the hill.
									40	......	First test, 8th August; tubers small to medium; not dry when cooked, but good flavour.
									60	1	Second test, 30th August; improving in size and dryer when cooked
									75	....	Third test, 23rd September; medium in size, but very uniform; dry and floury when cooked and good flavour.
											Fourth test, 25th December; a good potato.
Thorburn...........	May 25	Sept. 27	Oct. 20	187½	30½	218	399	40	90	......	Nearly all large and smooth; fair growth of tops.
									75	1	First test, 9th August; large average; smooth, fine-looking potato, but does not cook dry.
									80	2	Second test, 24th August; large, smooth, but not dry; poor flavour.
									85	5	Third test, 17th September; large, smooth, fine-looking potato; poor for table.
											Fourth test, 3rd December; not good; large number rotten.
Early Rose..........	May 25	Sept. 7	Oct. 20	174	30¼	214¼	374	27½	90	......	Fair growth of tops.
									60	......	First test, 2nd August; dry and mealy; large average in size.
									75	1	Second test, 25th August; dry and mealy; good flavour.
											Third test, 22nd October; dry and good flavour; large, smooth potato.
											Fourth test, 19th December; keeping well.
Early Puritan	May 25	Sept. 20	Oct. 20	100¼	23¾	122	223	40	80	.....	Strong growth of tops; fair average size; even, smooth potato.
									60	.....	First test, 8th August; fair size; very few; too small for table; dry and good flavour.
									75	.....	Second test, 26th August; fair size; dry and good flavour.
											Third test, 4th December; good flavour; dry when cooked; keeping well.
Chicago Market.....	May 25	Sept. 27	Oct. 21	95	9½	104½	191	35	75	......	Growth of tops, fair.
									60	.....	First test, 9th August; few in a hill, but even in size and smooth; quality, fair.
									60	...	Second test, 24th August; large average in size; flavour good, but not dry when cooked.
									75	1	Third test, 27th October; good average size; flavour good; quality, fair.
											Fourth test, 26th December; good size; quality, good.
Empire State..	do 25	do 20	do 21	169	24	193	353	50	85	......	Vigorous growth of tops.
									25	2	First test, 11th August; tubers small to medium; not a good potato.
									35	8	Second test, 21st August; improving in size and quality.
									60	20	Third test, 31st August; quality fair; flavour medium.
										20	Fourth test, 25th November; fairly good, but rotting.

POTATOES.

Variety.	Planted.	Mature.	Harvested.	Sound Tubers.	Rotten Tubers.	Total.	Yield Per Acre.		Per cent Market-able at each Test.	Rotten.	Remarks.
				Lbs.	Lbs.	Lbs.	Bush.	Lbs.		p. c.	
Brownell's Winner..	May 25	Sept. 23	Oct. 21	97	$50\frac{1}{2}$	$147\frac{1}{2}$	270	25	60	....	Vigorous growth of tops.
									30	2	First test, 10th August; tubers small to medium; quality poor.
									35	5	Second test, 27th August do do do
									50	......	Third test, 1st October; small average size; quality poor.
											Fourth test, 29th December; quality poor.
Rochester Favourite. In row, 66 ft.; seed given by Mr. F. Passingham, of Agassiz.	do 25	do 26	do 21	120	13	$133\frac{1}{2}$	244	45	85	......	Vigorous growth of tops.
									70	....	First test, 30th July; too young to be dry, but quality fair; size small to medium.
									75	......	Second test, 19th August; improving in size and quality.
									75	2	Third test, 31st August; large to medium in size; flavour good, but not dry when cooked; the large tubers very rough and knotty.
											Fourth test, 7th January; quality good; keeping very well.
Green Mountain.... 1 row, 66 ft.; seed given by Mr. F. Passingham, of Agassiz.	do 25	do 27	do 21	120	34	154	282	20	80	......	Fair growth of tops.
									30	1	First test, 18th August; small to medium in size; cooks dry and floury; good flavour.
									75	......	Second test, 1st September; dry and mealy; good flavour; improving in size.
									80	.....	Third test, 25th September; improving in size; smooth; fine cooking potato.
											Fourth test, 30th November; a good potato.
Ohio Gunner...... 1 row, 66 ft.; seed given by Mr. F. Passingham, of Agassiz.	do 25	....	....	$27\frac{1}{4}$	$3\frac{1}{2}$	$30\frac{3}{4}$	120	5	75	......	Fair growth of tops; size of tubers, large to medium small.
									30	....	First test, 1st August; medium in quality; not very dry.
									50	......	Second test, 3rd September; quality fair; not very dry.
									60	.. ...	Third test, 8th October; improving; medium in flavour.
											Fourth test, 1st December; fairly good.
Lee's Favourite..... From Judge Porter, Quebec.	do 25	Sept. 10	do 21	40	$6\frac{1}{2}$	$46\frac{1}{2}$	170	30	85	....	Fair growth of tops; tubers medium to large.
									50	1	First test, 3rd August; fair average size; dry and floury when cooked.
									60	2	Second test, 22nd August; size medium; quality good.
									75	2	Third test, 1st October; good quality; dry, and good flavour.
											Fourth test, 10th December; good potato; keeping well.

FRUIT TREES.

Apples.

When the report for 1890 was issued there were 97 varieties of apples and 321 trees on the experimental farm. Since then two have been destroyed by cattle and five have died from other causes. The remaining 314 have made a strong vigorous growth. From the Central Experimental Farm and other sources there have been added to the list 79 varieties of standard apples, and four of crabs, making a total of 176 varieties of standard apples, and 10 varieties of crabs, in all 582 apple trees at present growing on the farm. A few of these have been received this fall; the greater part were received and planted last spring, and like those planted the previous year, have made a strong, healthy growth.

The following is a list of those received this year:—

Hominy,
Summer Queen,
American Summer Pearmain,
Carter's Blue,
Ortley,
Buckingham,
Red Winter Pearmain,
Bradford's Best,
Winesap,
Missouri Pippin,
Paradise Sweet,
Huntsman's Favourite,
Southern Limbertwig,
Shirley,
Lincoln,
Bledsoe,
Loy,
Steward,
York Imperial,
Yate (crab),
Martha (crab),
Bieloe Naliv (Solovieff),
Skrisch (Grell),
Putim (Tchernigov),
Extra (Solovieff),
Borovinka (Solovieff),
Golden Stone (Niemitz),
Gruschevka (Solovieff),
Gremuch,
Skvosnina (Grell),
Gul Pembe,
Lebedka,
Plikanoff,
Borodovka,
Niemitz,
Steklianka,
Kara Synap, B.
Paperovka,
Dvinnœ,
Sklanka,
Skrut (Grell),
Sara Synap.
Jacob Sweet,
Whenercy's Late Red,
Glowing Coal,
Scarlet Cranberry,
Ruby Gem,
Ivanhoe,
Turnbull Sweet,
Munson's Sweet,
Danver's Sweet,
Maverick's Sweet,
Nickajack,
Arkansas Black,
Lowell,
Benoni,
Dominie,
Flory Bellefleur,
Forest,
Willow Twig,
Carlough,
Van Wycke (crab),
Gideon (crab),
Plodovitka, (Solovieff),
Hara Synap, A.,
Arkad (Grell),
Titovka Koslov,
Koritchnevoe,
Somnitelnoe,
Plodovitka (Koslov),
Miron (Grell),
Stone Antonovka (Tchernigov),
Russian Tyrol,
Arkad (Solovieff),
Zolotoreff,
Titovka (Solovieff),
Lapough (Koslov),
Naliv, Ausjutin,
Chelebi (Niemetz),
Miron (Solovieff),
Aport (Grell),
Borovinka (Koslov),
Plodovitka (Solovieff),

Pears.

One standard pear tree died since my last report; all others, both standard and dwarf, have made a vigorous growth.

This year there were received 69 standard and 28 dwarf pear trees; a number of the standards are of varieties already planted in the pear orchard, but these are for testing on the bench lands, where they will be planted as soon as spring opens.

The collection of standard pears consists now of 54 varieties and 248 trees, and dwarf pears of 22 varieties and 66 trees.

Plums and Prunes.

All the plum trees mentioned in my report of last year are alive, and have made a very vigorous growth, and two trees, one each of the Damson and Moore's Arctic, fruited this year, and if no unfavourable conditions arise, there is likely to be quite a crop of plums next season.

There has been added to this orchard a number of new varieties, among them, four of the newly introduced Japanese plums. The collection now comprises 188 trees and 68 varieties.

The following are those received this year:—

Lone Star,	Transparent,
Wooten,	Quaker,
Forest Garden,	Golden Beauty
Wayland,	Wild Goose,
Deep Creek,	Mariana,
De Soto,	Robinson,
Pottawattamie,	Garfield,
Yosobe,	Hattankio,
Shiro Smomo,	Clyman.

Cherries.

Since my last report three cherry trees have died. All others have made a strong healthy growth. The Elton, Yellow Spanish, Montmorency and Willamette produced a few cherries each. The robins did not allow them to remain long enough on the trees to ripen. An effort will be made to protect the fruit next year. Ten trees, 2 each of 5 varieties, have been added to the collection of cherry trees this year. There are now 46 varieties and 144 trees.

The new varieties are: Luelling, Belle de Choisy, Centennial, Ohio Beauty and Belle Magnifique.

FRUIT TREES PLANTED ON THE BENCH.

Figs, peaches, apricots, nectarines, grapes and cherries planted on the bench land, have made very satisfactory progress.

The Japanese orange was frozen to the snow line in February, but it threw out shoots from the ground, and has made a fair growth during the past season.

The peach trees were in bloom, from five to seven days earlier on the bench land than the same varieties planted in the valley, and were not affected by the cold wave in the beginning of May, which blighted the fruit prospects of peach trees in the valley.

Notes have been kept of the curl leaf, in 1890 and 1891, on the peaches, and nectarines, both in the valley, and on the bench. It has not been very severe in either place.

Below is a list of the varieties that have been free from curled leaf in both years, on the bench and in the valley. Many sorts were only slightly affected—from 5 to 10 per cent of the leaves. Several varieties were only slightly affected in one place,

but not in the other. These are noted, as well as some that were healthy, but were not planted in both localities.

Variety.	Free in the Valley.	Free on the Bench.
	Year.	Year.
Foster	1890 and 1891	1890 and 1891
Early Crawford	do do	do do
Schumaker	do do	do do
Coolidge's Favourite	do do	do do
Stump	*do do	do do
Surprise Melocoton	do do	None planted on bench.
Malta	do do	do do
Alexander	do do	1890 and *1891
Early Barnard	do do	*1890 do
Lemon	do do	1890 do

*Slightly curled.

Peaches.

The peaches have done extra well this year. Only one tree died, and each one living has made a strong, healthy growth, and with a favourable season in 1892 we expect most of those planted in 1890 to fruit.

There have been 31 varieties, 205 trees, added to our collection of peaches, making 116 varieties and 412 trees.

In an account of trees planted on the bench will be found a list of the peach trees affected by curl leaf. The attack was not so severe this summer, either on the bench or in the valley, as in 1890.

Below is a list of the names of the new peaches:—

Chinese Cling,
William's Favourite,
Miss Lolo,
Mamie Ross,
Bishop,
Eldred,
Minnie,
Amelia,
June Rose,
Family Favourite,
Jennie Worthen,
Gen. Taylor,
Gen. Lee,
Sylphide,
Bequett Cling,
Orange Cling
Columbia,
Scruggs,
Gaylord,
Crothers,
Walker,
Infant Wonder,
Levys Late,
Husted's Early,
Williamson's Choice,
Early Charlotte,
Mrs. Brett,
Gov. Briggs,
Old Mixon, Cling,
Bequett Free,
Onderdonk,

The peach trees, Mountain Rose, Hilborn, Wager, Foster and Waterloo, blossomed and bore fruit. In most cases not more than two peaches were allowed to mature.

The following is the order of their ripening:—Hilborn, 12th August; Waterloo, 25th August; Mountain Rose, 31st August; Foster, 1st September.

Nectarines.

No new varieties of nectarines have been added to the collection this season. There are now in the orchard 12 varieties and 26 strong, healthy trees. Downton and Early Violet were entirely free from curl leaf; all the others were affected a little, but it did not appear to injure them for all have since made a vigorous growth.

Apricots.

The soil and climate at Agassiz appear to be very suitable for a healthy growth of this tree. All those planted have done remarkably well.

A severe wind storm struck the apricot orchard on 23rd July, breaking two very promising trees off at the ground, entirely destroying them. This is the only loss which has yet occurred in this fruit. Two varieties have been added to the orchard during the past season, making 45 trees and 19 varieties in all. Myers Early and Eureka are the newly-added sorts.

Quinces.

The quinces have made a healthy growth. No new varieties have been added this year, and none have died. There are now on the farm 6 varieties and 13 trees.

FIGS.

The two varieties of figs reported on last year have made an extra fine growth this season. The frost of last February did not injure even the terminal buds. In the spring two each of the following varieties were planted and have done well:—

Angelique,
Castle Kennedy,
Brown Ischia,
Col. Signora de Bianca.

This fall the following varieties have been received. They are "heeled in" and will be planted in the spring:—

Adriatic,
Blue Celestial,
Black California,
Marseilles,
San Pedro.

making a total of 22 trees and 11 varieties.

The following other new fruits have been received and "heeled in," ready for spring planting:—

Pomegranate—2 Spanish Ruby.
Citrus Trifoliata—2 Hardy Orange.
Dwarf Juneberry—6 Success.
Japanese Persimmons, 2 each of the following sorts:—Daidai Maru, Hachija, Hyakume, Kurokume, Tane Nashi, or seedless; Yedoichi, Yemon, Zin Ji Maru.

GRAPE VINES.

All of the grape vines planted are alive, and almost all have made a healthy growth. There are now on the farm 224 vines of 85 varieties. The following varieties have been added this year:—2 Clinton, crossed with Muscat Hamburgh; 1 Abyssinia (Haskins); 1 Seedling No. 1, crossed with Muscat Hamburgh; 2 Improved Wild Grape (Gibb); 2 Janesville.

STRAWBERRIES.

The plot chosen for the small fruits, when there is long-continued heavy rains, receives a considerable quantity of water from the mountain, and when the frost came in February last the land was so full of water that it heaved very badly, and the strawberries and other small fruits which had been set out in the fall of 1890 were thrown out of the ground and many of them killed.

Those alive this fall are well-rooted, vigorous plants, and will furnish material for a new plantation, which will be made next summer.

The following is a list of those planted, the number of each kind, and the number alive in May:—

Variety.	Planted.	Alive.	Variety.	Planted.	Alive.
May King	200	51	Pine Apple	100	13
Hathaway	200	64	Captain Jack	200	46
Black Giant	200	28	Wilson	200	98
Bubach	200	98	Sharpless	200	61
Seneca Queen	200	73	Norman	200	10
Manchester	200	106	Itaska	200	42
James Vick	200	124	New Dominion	200	30
Woodruff	200	43	Jessie	200	23
Jumbo	200	54	Warfield No. 2	100	5
Emerald	200	91	Haverland	100	0
Chas. Downing	200	96	Connecticut Queen	200	51
Photo	200	9	Prince of Berries	100	15
Cumberland Triumph	200	28	Osceola	100	16
Windsor Chief	200	29	Old Ironclad	200	25
Atlantic	200	91	Crescent	200	40
Wonderful	200	72	Mary Fletcher	200	54
Maggie	200	21	Jersey Queen	100	45
Belmont	100	4	Green Prolific	100	1
Bordelaise	100	11	Mrs. Garfield	200	81
Gandy	100	9			

RASPBERRIES.

The following list comprises the raspberries now growing on the Experimental Farm, showing the number planted in 1890 and alive in 1891. Most of these have since made vigorous growth and are expected to fruit well next season:—

Variety.	Planted.	Alive in May, 1891.	Variety.	Planted.	Alive in May, 1891.
Cuthbert	136	48	Brinckle's Orange	34	12
Marlboro'	34	18	Souhegan	34	1
Turner	34	17	Golden Queen	68	39
Caroline	34	30	Shaffer's Colossal	68	7
Brandywine	34	27	Mammoth Cluster	34	7
Hebner	34	29	Clark	34	10
Saunders' Seedlings, 6 varieties	33	23	Hornet	34	10
Hansell	34	26	Franconia	21	2
Gregg	34	12	H. R. Antwerp	34	2

The following have been received this fall and will be planted in the spring, making in all 33 varieties of red raspberries and black caps:—

Variety.	Number.	Variety.	Number.
Kansas Black Cap	12	Jackson's May King	12
Older	12	Palmer	12
Lovett	12	Ada	12
Thompson's Early Prolific	12	Cromwell	13
Smith's Prolific	12	Progress	12

BLACKBERRIES.

Like the strawberries, these suffered considerably last winter from heaving out, and those not killed were so feeble that but few made a vigorous growth.

Variety.	Planted.	Alive 9th May.	Variety.	Planted.	Alive 9th May.
Snyder	26	23	Wilson Jr.	204	94
Agawam	26	24	Wilson's Early	168	54
Taylor's Prolific	16	14	Lawton	68	63
Gainor	34	1	Erie	68	65
Western Triumph	34	0	Early King	68	62
Stone's Hardy	22	5	Minnewaska	22	4
Early Cluster	24	2	Early Harvest	24	32
Tecumseh	10	2	Crystal White	16	2
Kittatinny	136	23	Lucretia Dewberry	50	23

The part of the plot where Wilson Jr., Wilson's Early, Lawton, Erie and Early King were planted was a little the highest and dryest, which is probably the reason why a larger percentage of these sorts lived.

The following new varieties were received this year:—Lovett's Best, Thompson's Early, Evergreen, Dallas, Child's Tree, Brunton.

BLACK CURRANT.

The black currant does not appear to have suffered from the heaving of the ground as the other small fruits did, as all have made a healthy, vigorous growth. Last spring 15 new varieties of Saunders' Seedlings were received from the Central Experimental Farm, which makes the collection of this fruit fairly large, numbering nearly 200 bushes and 29 varieties.

RED AND WHITE CURRANTS.

The currants stood the winter better than the berries. Very few of them died, but all were considerably enfeebled. and did not make a very vigorous growth. As they are now well rooted they will, it is hoped, come through this winter in good condition.

Only one new variety has been received this year, viz., 12 plants of North Star.

The number of plants of each variety planted in the fall of 1890 and alive now is as follows:—

Variety.	Planted Fall of 1890.	Alive Fall of 1891.
White—		
White Grape	31	31
White Dutch	18	18
Red—		
Red Cherry	10	10
Fay's Prolific	46	43
Versillaise	28	28
Moore's Ruby	29	28
Victoria	36	36
Red Dutch	18	18
North Star	....	12
	216	224

GOOSEBERRIES.

The Transparent was the only variety which was entirely free from mildew last summer.

The Triumph suffered slightly, the others severely, owing perhaps to the feeble condition of the bushes, on account of the frost heaving them out of the ground during the winter.

They were given a dressing of ashes in summer and late in the autumn mulched heavily with manure, and it is hoped they will winter without injury.

The nursery firm of McKenzie & McDonald, of Salem, Oregon, very kindly sent for test a dozen bushes of the Oregon Champion gooseberry, said to be exempt from mildew on this coast.

We have also to thank them for two fine peach trees of the Early Charlotte variety.

The collection of gooseberries now consists of 11 varieties and over 100 bushes.

NUT-BEARING AND OTHER USEFUL AND ORNAMENTAL TREES AND SHRUBS.

The nut-bearing trees, such as American, English and Japanese walnut, American, Japanese and Spanish chestnut, butternut, hard and soft shelled almond, peccan and filbert, have made satisfactory growth.

Also the forest trees of Eastern Canada, such as maple, ash, elm, beech, larch, pine and spruce, have done remarkably well, some of them having made, for the past season, a growth of over 7 feet, and give promise of being a gratifying success in this province.

The useful and ornamental trees and shrubs from France have, in most cases, made a vigorous growth. The mild spring-like weather of December and January caused some of the shrubs and small fruits to throw out buds, and the frost of February, combined with the cold and wet weather of March and April, had a damaging effect upon them; but when warm growing weather came they, with one or two exceptions, recovered and made a strong, healthy growth, and, as they are now well rooted, are, I hope, safely acclimated.

Within the last year there has been added to the collection, nearly 200 varieties of trees and shrubs, making now in all about 600 varieties.

Several hundreds of Manitoba ash and box elder have been raised from seed received from the Central Experimental Farm last spring.

This fall there was received from the Central Experimental Farm a supply of butternut, hickory and pig nut, hickory nuts, also beech and maple seed. These, it is expected, will make quite an addition to the stock of trees next year.

BULBS AND FLOWERS.

In addition to the bulbs noted in my report of 1890 as having been received and planted last fall, there were quite a number of bulbs and annuals planted and sown this last spring. These, together with the flowering shrubs, gave us a succession of beautiful flowers from March until the frost which came early in December.

LIVE STOCK.

There are four heavy draft and two general purpose horses on the farm.

The cattle consists of the cow and bull of the Shorthorn breed bought in 1889, and their increase. The heifer calf of 1890 has developed into a fine heifer, and this year the cow had a bull calf, which is now a very fine animal.

There has been no sickness of any kind among the stock this last year.

POULTRY.

The hens have done fairly well this year, but are in need of better accommodations than the temporary building put up for them in the fall of 1889.

After two years' experience with flocks of Houdans, Wyandottes, White Leghorns and White-faced Black Spanish, I have no hesitation in recommending the Wyandottes as by far the best of the four breeds tested for this climate, being good layers of medium-sized eggs, and the chicks are hardy and healthy, and they mature early. The young pullets begin to lay early and are good winter layers.

The fall exhibitions at Victoria, New Westminster and Ashcroft were attended and an exhibit of grains and roots made. A contribution of grain in the straw was also made to the exhibit made by British Columbia at the shows in Eastern Canada, and a small collection of fruit from the old orchard sent to be exhibited at some of the exhibitions in Manitoba and the North-West Territories.

Since my last report a very comfortable residence has been built for the superintendent, and the contract for a barn awarded. It is to be hoped it will be completed in time for next harvest, the old building at present in use being only large enough to shelter our stock, and furnishes no accommodation for grain. The want of such accommodation in this climate adds very considerably to the difficulty of harvesting and securing the crops.

I have the honour to be, Sir,

Your obedient servant,

THOS. A. SHARPE.

STATEMENT of Expenditure on the Dominion Experimental Farms, for the Year ending 30th June, 1891.

CENTRAL EXPERIMENTAL FARM.

EXPENDITURES, 1st July, 1890, to 30th June, 1891.

	$ cts.
Horses, harness, &c	200 23
Cattle	538 97
Implements, tools, hardware	1,582 56
Draining and drain tiles	372 87
Grading and roadmaking	675 35
Cattle and horse feed	609 69
Blacksmithing and repairs	352 40
Seed grain, trees and shrubs	1,556 98
Stable manure, ashes and fertilizers	1,215 79
Exhibition expenses	380 81
Books, periodicals and newspapers	168 75
Printing and stationery	2,353 84
Telegrams and telephones	223 81
Travelling expenses	755 71
Chemical department	473 35
Poultry department	248 41
Seed testing and care of propagating houses	627 16
Seed grain distribution	2,177 92
Tree distribution	1,280 61
Salaries	11,350 23
Wages, farm work, including experimental work with grain and other farm crops	4,045 53
do care of stock	1,128 08
do horticultural department	1,841 13
do botanical department	365 22
do care of grounds, shrubbery and ornamental trees	753 63
do office help with correspondence, distributing reports and bulletins, and messengers services	1,284 56
Water account, including excavations, &c	230 82
Contingencies	543 42
	37,337 83

EXPERIMENTAL FARM, MARITIME PROVINCES.

EXPENDITURES, 1st July, 1890, to 30th June, 1891.

	$ cts.
Harness	12 47
Cattle	2,621 95
Implements, tools, hardware	210 21
Draining and drain tiles	346 39
Grading, roadmaking, clearing	313 24
Cattle and horse feed	29 70
Blacksmithing and repairs	49 96
Seed grain, trees, shrubs, &c	101 24
Stable manure and fertilizers	370 60
Exhibition expenses	77 08
Travelling expenses	162 17
Salaries	1,200 00
Wages, farm work, including experimental work with farm crops, fruit trees, vines, &c	1,615 57
do care of stock	887 64
do office help	120 00
Contingencies	55 83
	8,174 05

EXPERIMENTAL FARM, MANITOBA.

Expenditures, 1st July, 1890, to 30th June, 1891.

	$ cts.
Harness	78 45
Implements, tools, hardware	704 70
Grading, roadmaking, &c	441 46
Horse and cattle feed	307 43
Blacksmithing and repairs	180 95
Seed grain, trees, shrubs, &c	254 87
Exhibition expenses	238 22
Books, periodicals and newspapers	43 10
Telegrams and telephone	127 89
Travelling expenses	78 60
Forestry	755 87
Salaries	1,200 00
Trees and plant distribution	44 58
Office assistance	53 25
Farm wages, including experimental work with farm crops, fruit trees, vines, &c	3,957 50
Contingencies	347 70
	8,814 57

EXPERIMENTAL FARM, NORTH-WEST TERRITORIES.

Expenditures, 1st July, 1890, to 30th June, 1891.

	$ cts.
Harness, &c	45 99
Cattle	3,374 37
Implements, tools, hardware	784 90
Cattle and horse feed	743 26
Blacksmithing and repairs	149 95
Seed grain, trees, shrubs, &c	273 32
Exhibition expenses	236 35
Books, periodicals and newspapers	31 10
Travelling expenses	100 60
Forestry	419 63
Salaries	1,200 00
Grading and roadmaking	21 00
Wages, farm work, including experimental work with farm crops, fruit trees, vines, &c	4,460 46
do care of stock	762 05
do office help	120 00
Contingencies	771 62
	13,494 60

EXPERIMENTAL FARM, BRITISH COLUMBIA.

Expenditures, 1st July, 1890, to 30th June, 1891.

	$ cts.
Harness, &c	20 50
Implements, tools, hardware	426 23
Clearing, grading, &c	2,345 96
Cattle and horse feed	903 84
Blacksmithing and repairs	51 25
Seed grain, trees, shrubs, &c	198 37
Books, periodicals and newspapers	28 90
Travelling expenses	126 25
Salaries	1,200 00
Wages, farm work, including experimental work with farm crops, fruit trees, vines, &c	2,025 34
do office help	100 00
Exhibition expenses	6 60
Contingencies, including house-rent	317 60
	7,750 84

SUMMARY.

TOTAL EXPENDITURE for Experimental Farms, 1890-91.

	$ cts.
Maintenance account—	
Central Experimental Farm, Ottawa	37,337 83
Experimental Farm for Maritime Provinces, Nappan, N.S.	8,174 05
do Manitoba, Brandon	8,814 57
do North-West Territories, Indian Head	13,494 60
do British Columbia, Agassiz	7,750 84
	75,571 89
Capital account—	
Erection of dairy building and piggery at Central Experimental Farm, Ottawa	3,967 02
Paid for land, Experimental Farm, Indian Head	7,680 00
Land account, Experimental Farm, Nappan, N.S., legal expenses and surveys	145 14
do do Agassiz, B.C.	135 95
	11,928 11

In the sum charged to the Central Experimental Farm in the foregoing summary, many items are included which should be shared, to some extent, by each of the other farms. The amount paid for the salaries of the chief officers who devote a large part of their time to the branch farms and to the interests of farmers residing in the provinces where these farms are located, should be divided between the Central and other experimental farms. The following accounts should also be apportioned in a similar manner. Printing and stationery, office help for the distribution of bulletins and for conducting the correspondence with farmers all over the Dominion; the purchase of seed grain, trees and shrubs, the distribution of grain for test, also young forest trees and tree seeds. The cost of the special experiments in seed testing with grasses and grain, and the outlays connected with the botanical chemical and much of the horticultural work, should also be divided since these are all of a general nature in the benefits of which all the experimental farms share. If these accounts were divided and apportioned as suggested the sum charged against the Central Experimental Farm would be very much reduced.

INDEX.

APPENDIX TO THE REPORT OF THE MINISTER OF AGRICULTURE

EXPERIMENTAL FARMS

REPORTS

OF THE

DIRECTOR			WM. SAUNDERS.
AGRICULTURIST			JAS. W. ROBERTSON.
HORTICULTURIST			JOHN CRAIG.
CHEMIST			F. T. SHUTT, M.A.
ENTOMOLOGIST and BOTANIST			JAS. FLETCHER.
POULTRY MANAGER			A. G. GILBERT.
SUPT. EXPERIMENTAL	FARM,	Nappan, N.S.	WM. M. BLAIR.
do	do	Brandon, Manitoba.	S. A. BEDFORD.
do	do	Indian Head, N.-W.T.	ANGUS MACKAY.
do	do	Agassiz, B.C.	THOS. A. SHARPE.

FOR

1892

PRINTED BY ORDER OF PARLIAMENT

OTTAWA
PRINTED BY S. E. DAWSON, PRINTER TO THE QUEEN'S MOST EXCELLENT MAJESTY
1893

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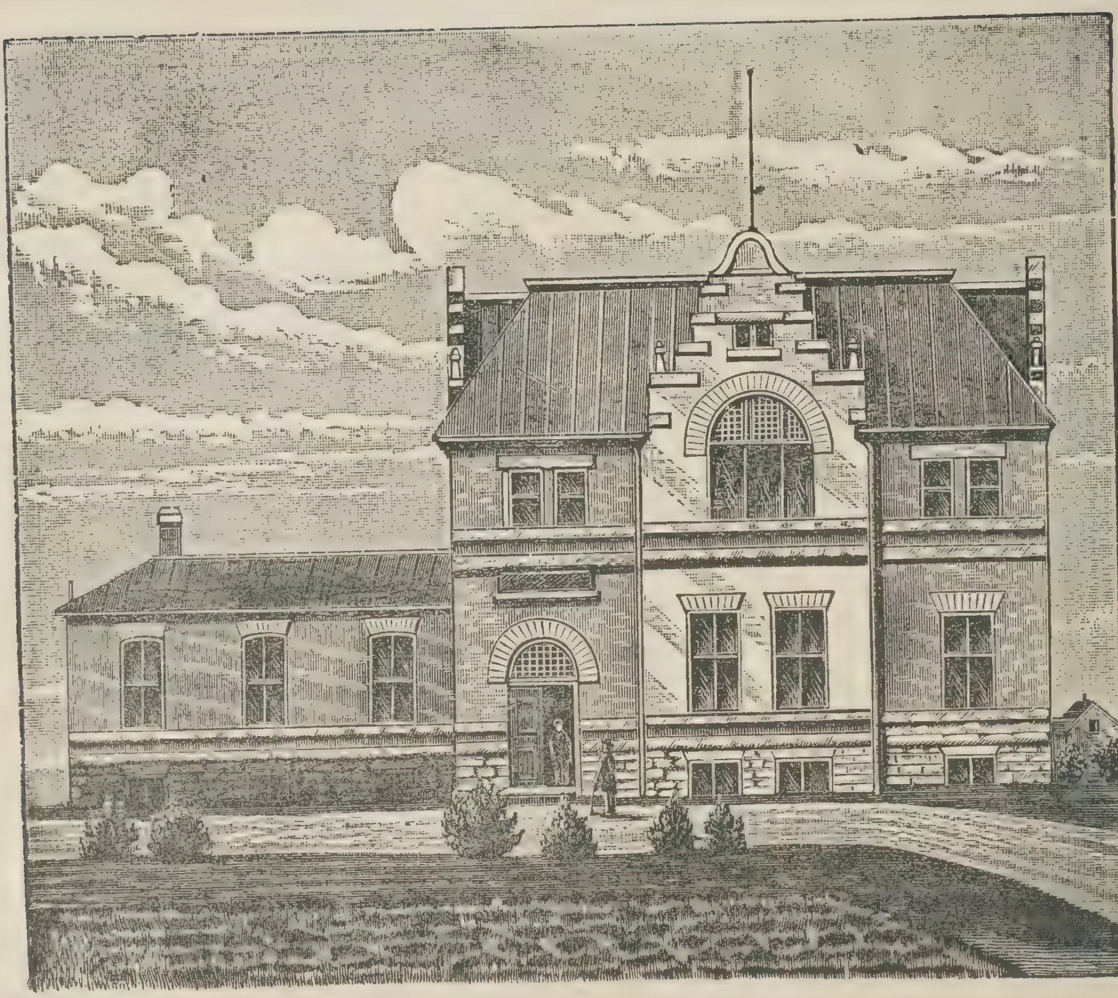


Figure 1.—Office Building, Museum and Chemical Laboratory of the Central Experimental Farm.

APPENDIX

TO THE

REPORT OF THE MINISTER OF AGRICULTURE

ON

EXPERIMENTAL FARMS.

OTTAWA, 6th February, 1893.

The Honourable
The Minister of Agriculture,
Ottawa.

SIR,—I have the honour to submit herewith for your approval the sixth annual report of some of the work done and in progress at the several experimental farms which have been established in different parts of the Dominion.

You will also find appended reports from the following officers of the Central Experimental Farms:—From the Agriculturist, Mr. James W. Robertson; from the Horticulturist, Mr. John Craig; from the Chemist, Mr. Frank T. Shutt, and from the Entomologist and Botanist, Mr. James Fletcher. A report is also submitted from the Poultry Manager, Mr. A. G. Gilbert.

From the branch experimental farms there are reports from Mr. Wm. M. Blair, superintendent of the experimental farm for the Maritime Provinces, at Nappan, Nova Scotia; from Mr. S. A. Bedford, superintendent of the experimental farm for Manitoba, at Brandon; from Mr. Angus Mackay, superintendent of the experimental farm for the North-west Territories, at Indian Head; and from Mr. Thos. A. Sharpe, superintendent of the experimental farm for British Columbia, at Agassiz.

These reports embody the results of much careful experimental work bearing on agriculture and horticulture. They also contain information on chemical work relating to agriculture, together with many facts concerning injurious insects and plants and the best methods of preventing their ravages.

It is hoped that the results obtained from the experimental work recorded in this report will be helpful to all those who are engaged in cultivating the soil and that they will thus assist in the advancement of agriculture in this Dominion.

I have the honour to be, sir,
Your obedient servant,

WM. SAUNDERS.

ANNUAL REPORT

ON THE

EXPERIMENTAL FARMS.

REPORT OF THE DIRECTOR.

Six years have passed since the initial steps were taken towards establishing a sytem of Experimental Farms for the Dominion of Canada. Prior to this, during the Session of the House of Commons in 1884, a select committee was appointed of which Mr. G. A. Gigault was chairman to inquire into the best means of encouraging and developing the agricultural interests of Canada and this committee made a report in favour of the establishment of an experimental farm. No further steps, however, were taken in this direction until November, 1885, when an investigation was undertaken by the writer under instruction of the Honourable John Carling, Minister of Agriculture, for the purpose of ascertaining the condition of experimental work in agriculture in the United States, Great Britain and other countries and a report was prepared on this subject under date of 20th February, 1886, which was submitted to the House of Commons during the session of that year. "The Experimental Farm Station Act," which was based on the recommendations embodied in that report, was introduced shortly after and passed with the concurrence of both sides of the House, and on the 16th of October following, the organization was begun by the appointment of a Director to undertake the work.

One of the provisions of the Act required that the Central Experimental Farm, which was to serve the provinces of Ontario and Quebec should be located near the Capital, and prior to my appointment I had been instructed by the Honourable Minister of Agriculture to inspect those farms near Ottawa, some twenty in all, which had been offered for sale to the Government as sites for the Central Experimental Farm. Associated with me in this work was Mr. A. E. S. K. Barclay, of London, Ontario, a man of much experience in land inspection, whose advice and assistance was most valuable. After spending several weeks on this work it was found that none of the farms offered possessed the combined features desired in the Central Experimental Farm, when instructions were received to visit and inspect other farms not offered in the neighbourhood of the capital, when among others the present site was examined. Finding that this land, although in a very rough condition and parts of it very swampy, presented advantages greater than those of any other farm in the neighbourhood in its variety of soil, contiguity to the city, commanding position as to elevation, facilities for drainage, &c., which made it eminently desirable for the purpose, a report was prepared recommending that this farm be chosen. Shortly after this a portion of the land was purchased at private sale and the remaining area required was expropriated under the Act and the prices to be paid for the several portions subsequently fixed by the Dominion Arbitrators.

The day following that of my appointment as Director of Experimental Farms I left for the Maritime Provinces to enter on a systematic inquiry into the conditions of agriculture in all the settled portions of the Dominion from the Atlantic to the Pacific, for the purpose of ascertaining where the experimental farms which it was designed to establish in the several provinces could be best located so as to confer the greatest benefit on the farmers of the Dominion.

During the interval which had elapsed between the passing of the Experimental Farms Act and the appointment of the Director, many offers of land had been made to the Government in all the provinces and territories, and in justice to the parties concerned, it seemed necessary that all those farms offered, which were in central or promising localities, should be inspected and reported on, and to accomplish this involved much time and labour.

Since it was designed that the Experimental Farm to be established in the Maritime Provinces should serve the requirements of the three provinces, viz., Nova Scotia, New Brunswick and Prince Edward Island, there were many reasons why it was desirable that this farm should be located not far from the boundary line between Nova Scotia and New Brunswick, so that it might be almost equally accessible to the farmers of these two provinces, and at the same time convenient for the farmers of Prince Edward Island. While all the farms offered to the Government in the Maritime Provinces were inspected and reported on, the greater care was given to the examination of those situated in the border counties of Cumberland and Colchester, in Nova Scotia, and of Westmoreland and Albert, in New Brunswick.

As soon as this preliminary survey of the sites offered in the Maritime Provinces was completed, the work was extended to Manitoba, the North-west Territories and British Columbia, and after nearly three months of continuous travel and inspection, I returned to Ottawa to report progress.

By the appointment on 1st November, 1886, of Mr. W. W. Hilborn, of Arkona, Ont., as Horticulturist of the Central Experimental Farm, the services of a practical farmer also those of a man of extended knowledge in fruit growing, were secured, and during my absence, under his supervision, work was begun on the Central Farm, and nearly twenty acres of the land ploughed before the winter set in. During the winter, Mr. Wm. M. Blair, of Truro, N.S., was selected as superintendent of the Experimental Farm for the Maritime Provinces, and as it had been arranged that each superintendent of the branch farms should, after appointment, spend several months with the Director at Ottawa to gain fuller information as to the aims and objects of the work, the practical knowledge of farming which Mr. Blair possessed, was made use of at the Central Farm when the spring opened. Mr. S. A. Bedford, of Moosomin, N.W.T., who was selected in May, 1887, as superintendent of the Experimental Farm for Manitoba, also joined the staff at Ottawa, which was further reinforced about the same time by the engagement of Mr. John Fixter, of London, Ont., as farm foreman. These all entered heartily into the undertaking, and bringing their practical knowledge to bear on the difficulties to be overcome, all branches of the work made rapid headway. On the 2nd of May the work of clearing, removal of stone, extracting of stumps and ploughing, was vigorously begun, and before the season closed a considerable area of land was cleared and brought under cultivation, the system of drainage to be carried out fully planned, some of the preliminary work done, and other improvements made. The contract for the fencing was let early in the spring, and completed before winter came.

During the summer the Maritime Provinces were again visited in company with Mr. Wm. M. Blair, whose intimate and practical acquaintance with the agriculture of these provinces, acquired by a life-long experience there, was of great assistance, and, after a second careful survey, the advantages offered by the present site of the Experimental Farm at Nappan, N.S., were recognized, and its purchase recommended. Subsequently, the recommendation was adopted, and the negotiations for the purchase completed during the following winter. This site is within half a mile of Nappan Station on the Intercolonial Railway, about eight miles from the boundary line between Nova Scotia and New Brunswick, and is easily accessible from Prince Edward Island. About three hundred acres were purchased, about two hundred of which were cleared and almost free from stumps; the other one hundred acres were wooded with spruce, larch, beech, maple and other useful trees. The advantages embodied in this site were variety of soil, partial shelter from prevailing winds, a central location, and proximity to the main line of travel. The soil of this farm fairly represents the better class of farms on the border line of the two provinces, and for a long distance on either side. It is

chiefly clay loam, more or less mixed with sand, becoming heavy or light, as clay or sand predominates, with some parts gravelly, and with a subsoil varying from clay to gravelly clay. The cleared land may be classified approximately as follows: Marsh or dyke land, valuable for the growth of hay, about 50 acres; lower upland, 50 acres, and higher upland, 100 acres. The higher land faces the west and overlooks the inlet from the Bay of Fundy, and commands a good view of the Maccan river and the surrounding country.

Under the judicious management of Mr. Blair this farm has been greatly improved, underdraining has effected remarkable changes in the relative fertility of portions of the land, valuable experimental work has been conducted with grain, fodder plants, roots, &c., orchards and belts of ornamental trees have been planted, the necessary buildings have been erected, and the barns and stables provided with useful breeds of animals. The details of the work accomplished will be found in the reports of the superintendent, embodied in the annual reports of the Experimental Farms.

Later, in the summer of 1887, another tour was made through the west in company with Mr. S. A. Bedford, who had resided for many years in Manitoba and the North-west Territories, and whose experience of farm life on the plains made him a valuable adviser. The investigations extended from Selkirk, twenty-one miles east of Winnipeg, along the line of the Canadian Pacific Railway, to the western boundary of Manitoba. North of Brandon, the country was examined as far as Binscarth, and from this point along the line of the Manitoba and North-western Railway to Portage la Prairie. Many journeys were taken north and south of the lines of railway which involved over 500 miles of driving, and afforded an excellent opportunity of ascertaining the character of the soil and the condition of the settlers over a large portion of the province.

After much consideration a site near Brandon was recommended and finally chosen, a farm of about 625 acres situated partly in the valley of the Assiniboine and partly on the higher land adjoining. This farm combines the advantages of variety of soil, fertile valley land for pasture, extending to the river, a rich sandy loam on the rise towards the bluffs which form the margin of the valley, on the sloping sides of which and in the ravines the soil is lighter, more sandy and gravelly, while on the heights the land is good and fairly represents the soil in most of the great wheat-growing districts of Manitoba. It adjoins the city of Brandon and is near the centre of one of the best agricultural sections in the province, it has an abundant supply of spring water of excellent quality is beautifully situated and in full view of the passing trains of the Canadian Pacific Railway.

Possession of this farm was had early in July, 1888, and since then under the superintendence of Mr. Bedford, rapid and satisfactory progress has been made in every department of the work. Particular attention has been devoted to experiments with grain, fodder crops and the best methods of treating the soil to prepare it for crop. The farm has been greatly beautified by the planting of avenues and groves of trees; commodious buildings have been erected and some of the most useful breeds of cattle introduced. Particulars of the progress made will be found in the annual reports.

During October, 1887, an extended tour was made through that part of the North-west Territories extending along the main line of railway, special attention being paid to that portion known as Eastern Assiniboia. The district lying between the Manitoba boundary and Fort Qu'Appelle, was driven over involving journeys in vehicles of over 400 miles in company with Mr. Bedford and Mr. A. Mackay of Indian Head; a wide area of country was inspected and examinations made of the character of the soil and much information gathered regarding the climate and especially with regard to rainfall. Similar investigations were made in the neighbourhood of Regina, Moose Jaw, Medicine Hat, Calgary and other important stations along the main line of railway.

Since by far the larger area of land in this part of the country is open prairie it was thought best to select a section of bare prairie for this farm with the view of showing what might be done in such case to provide eventually shelter both for crops

and buildings by tree planting. Several excellent sites were seen, but a section of land which was examined near the town of Indian Head was found to combine more advantages than any other farm inspected and this was finally chosen for the Experimental Farm for the North-west Territories. This section, No. 19, Township 18, Range 12 west, adjoins the town of Indian Head on the east, it lies north of the railway which skirts its boundary for about a mile. The soil is deep and of excellent quality and varies from a heavy clay to a sandy loam with a clay subsoil of a yellowish brown colour. The farm consists of 680 acres of land is situated 104 miles west of the Manitoba boundary, 105 miles north of the United States boundary and 44 miles east of Regina ; it is in the midst of a large and thriving agricultural settlement, is well supplied with water and its distance from the Indian Head railway station is but little more than half a mile.

Possession of this farm was had early in the spring of 1888 when Mr. A. Mackay who had received the appointment of superintendent and had spent some weeks on the Central Farm in Ottawa, entered on his duties on the 24th of April. During 1888 this farm was partly fenced and the fencing completed early in 1889 during which year buildings were also erected, dwellings, barn and stables and for the past four years the work of experimenting in all lines of agriculture and horticulture likely to be useful to the farmers of the North-west has been successfully carried on. A large number of young forest trees have been planted and the farm is now practically provided with shelter belts, forest clumps, avenues and hedges which although the planting is so recent are rapidly improving the general appearance of the farm and changing its character. Suitable breeds of dairy and beefing cattle have been supplied for the improvement of stock also swine and poultry and all are being utilized for experimental work. The results of tests of grain and fodder crops have been very useful and have shown that it is of the greatest importance that land to be cropped in this district should be fallowed during the previous summer as this treatment is almost invariably followed by good results. A large number of the hardier varieties of fruits have been tested, but while some sorts of small fruits such as gooseberries, currants, and raspberries do well,no satisfactory results have yet been obtained with apples, pears, plums or any of the larger fruits. A lively interest is taken in the results of the work at this farm by the settlers in the territories and especially by those residing near it in Eastern Assiniboia and the distribution of the annual reports giving the particulars of the practical work carried on by Mr. Mackay has already produced results which are highly gratifying.

The Experimental Farm for British Columbia was the last selected and put in operation. Two visits were made to this province within a year, the first in December, 1886, to gather preliminary information and acquire some general knowledge of the condition and requirements of the agriculture of the province and the second in September, 1887, for the special purpose of finding some suitable spot for the establishment of an experimental farm. During the latter visit I was accompanied by Mr. S. A. Bedford who gave much valued assistance. During these visits opportunities were afforded of examining many farms both on Vancouver Island and on the main land but of all the sites inspected none appeared to unite so many advantages as a part of the land belonging to the Agassiz estate adjoining the railway station known as Agassiz in the valley of the Fraser about 70 miles east of Vancouver. The land offered at this place for the purposes of an experimental farm and which was finally chosen consists of about 300 acres, opposite and adjoining the railway station with a frontage along the railway track of about half a mile. Along the western boundary is the road leading to the Harrison Hot Springs, a place of great resort five and a-half miles distant and in the rear rise rocky heights—with intervening patches of bench land—from 900 to 1,200 feet in height, more or less covered with shrubbery and heavy timber. About 35 acres of the valley land had been under partial cultivation and about 200 acres more had been cleared of most of the large timber with the stumps cut close to the ground but still undecayed and the surface occupied with brushwood and ferns. The soil varies from a clay loam through different grades of sandy loam to a soil of a gravelly character, with a porous subsoil, some parts sandy others a sandy clay under most of which lies a bed of gravel from three to five feet below the surface.

The land at Agassiz was purchased in 1888, but owing to delay in perfecting the title, it was not taken possession of until the autumn of 1889. Mr. Thos. A. Sharpe one of the early settlers in Southern Manitoba was appointed as Superintendent in July, 1889, and after spending a few weeks at the Central Farm he left for the coast taking with him horses and other supplies, and began work on the premises on the 19th of September, and before spring arrived the land formerly under cultivation had been thoroughly ploughed and prepared, and enough new land broken up and cleaned to admit of the planting of several orchards, and at the same time carry on a number of experimental tests with grain, fodder, crops and roots, particulars of which are given in the report of the Experimental Farm for 1890. Under the energetic management of Mr. Sharpe, the clearing of the land has been steadily pushed, and up to the present time one hundred and five acres have been brought under cultivation, and twenty acres more cleaned and stumped and ready for the plough. A dwelling for the superintendent has been erected, and a large combined barn and stable built which affords accommodation for stock and horses. Several of the best breeds of dairy cattle have been sent there, with swine, sheep and poultry, all of which are doing well. The climate is mild, much like that of some parts of England, and is well adapted for fruit growing. Since this promises to soon become one of the leading industries in that province, special attention has been given to the securing of a large number of varieties embracing the promising sorts in all classes, the object in view, being to establish large test orchards where the relative value of all varieties suited to the climate will be ascertained, and from the experience gained, information can be given to those about to plant as to the sorts best adapted to the climate, and those which promise the most profitable returns. Although only three years have elapsed since this enterprise was begun, there are now growing and under test at that farm 887 varieties of fruit, 569 of which are different sorts of large fruits, and 318 of small fruits. To bring together this collection, which is probably the largest on the continent, the nurseries of many countries have been laid under tribute, and whether received from the north or the south the trees seem to grow equally well, and with such rapidity as to astonish those who are accustomed only to the slower growth seen in the east.

Here also the different varieties of nut bearing trees are being tried: English and Japanese walnuts, hard and soft shelled almonds, Spanish, Japanese and American chestnuts, Kentish filberts, with pecans and hickory, and they all grow luxuriantly. British Columbia is noted for the wealth of its timber resources which are practically inexhaustible, but there are no hard woods of any consequence in that province. Hence in addition to the plantations of fruit and nut trees belts of hard woods have been and are being planted, in the valley and scattered also over the hill-sides, consisting of black walnut, butternut, elm, ash, hickory and other valued eastern and northern trees, and with the relatively rapid growth which trees make in that country the question as to how valuable these trees may be in that province will soon be determined, and if it can be shown that the so-called bench lands which are of little use for agricultural purposes can be gradually transformed into orchards and plantations of valuable hard wooded timber these experiments will prove of great value to that country.

In the meanwhile rapid progress has also been made at the Central Experimental Farm where a wilderness has been transformed into a series of well appointed fields, orchards and testing plots. Experiments have been carried on in all directions to test the earliness of varieties of cereals, their relative superiority in yield, quality of grain, stiffness of straw, &c. Those which have succeeded best have been scattered broadcast by a free distribution through the mails and thus about 30,000 sample of 3 lbs. each have been placed in the hands of about 12,000 to 15,000 farmers and these newer sorts are already in some localities influencing favourably the general character of the crops. The relative advantages resulting from early as compared with late sowing for the provinces of Ontario and Quebec have been clearly demonstrated by a series of tests extending over a period of three years, A large number of new varieties of grain have been originated here by cross-fertilization and some of them promise to be of great value. This work has been extended during the past year,

and new varieties originated by this method on each of the western farms also, with the hope that new sorts which have their birth-place in the countries in which they are to be grown will probably be better adapted to the climatic vicissitudes which they will have to endure. Varieties of fodder plants and roots have been tested in great numbers and the results of the work published in reports and bulletins; hundreds of thousands of which have found their way into the hands of appreciative readers.

The horticultural work has also made rapid progress, first under the superintendence of Mr. W. W. Hilborn and more recently under that of Mr. John Craig. A very large collection of fruits has been accumulated and the trees are now fast coming into bearing. Of small fruits a multitude has already been reported on, new varieties of much promise have been originated while a large number of different sorts of vegetables have been tested as to earliness, quality and other important points. The diseases which affect fruit trees and vines have been watched and the remedies which have been recommended thoroughly tested and the results given to the public in the annual reports.

With the appointment of Mr. James Fletcher, early in 1887, to the position of Entomologist and Botanist to the Dominion experimental farms, the subjects of insects and plants injurious to crops and the remedies for their subjugation have been made a subject of special study, much useful experience has been gained and the results have been given in reports and bulletins. Mr. Fletcher has also brought together a large collection of useful grasses and has succeeded in establishing a series of experimental plots with the object of determining their hardiness and relative usefulness as fodder plants. This branch of his work has been much appreciated, the large number of letters of inquiry which have been received from year to year in connection with these several divisions of the work indicate the lively interest which is taken in them.

In July, 1887, Mr. F. T. Shutt, was appointed as Chemist to the Domlnion experimental farms, which prepared the way for supplying some portion of the information needed in connection with the chemistry of agriculture. Shortly after his appointment Mr. Shutt accompanied the Director in a visit paid to several of the well known chemical laboratories in the United States, and by this means much useful information was accumulated and from the data obtained the size and form of the present laboratories were determined and the plans for the building prepared. While this structure was in course of erection Mr. Shutt proceeded to Europe and visited some of the more important laboratories in Great Britain and on the continent, and selected the necessary apparatus for the laboratory at Ottawa. On his return plans of the internal fittings were prepared and carried out, and as a result of this arrangement the chemical laboratory at the experimental farm has been made one of the most convenient and best fitted establishments for carrying on chemical work in relation to agriculture to be found in this country. The good work since accomplished by Mr. Shutt in the analysis of soils, fodder plants, natural fertilizers, such as muds, marls and mucks from many parts of the Dominion, also grasses, sugar-beets and many other substances have made his annual reports very valuable to the farming community.

During 1887 and 1888 the clearing of the land on the Central Experimental Farm was completed, the main drains and many of the branches measuring over fifteen miles in all were laid, most of the buildings planned and erected, avenues, ornamental hedges and clumps of shrubbery were planted, the land adjacent to the buildings graded and sodded and the whole aspect of the farm greatly improved. Extensive shelter belts and plantations of forest trees have since been planted which will eventually add much to the beauty of the place.

In May, 1888, experiments were begun with poultry and the services of Mr. A. G. Gilbert secured to carry on this work. Later in the season when the poultry building was ready for occupation, the birds which had been bred served to furnish it with stock and Mr. Gilbert was selected to fill the position of Poultry Manager. The annual reports he has given of the work carried on have been of much service

to those interested in poultry and have served as a guide to many in the management of fowls as well as in the selection of varieties.

On the 1st February, 1890, Mr. Jas. W. Robertson was appointed as Agriculturist to the Experimental Farm and Dairy Commissioner for the Dominion. In his capacity as agriculturist he has taken charge of the stock, originated the many important feeding tests which have been made and supervised the work. The dairy building and piggery were built in accordance with plans prepared by him and embody modern conveniences which simplify and lessen the work. In these buildings continued experiments have been carried on in connection with the manufacture of butter and the feeding of cattle and swine, and important bulletins and reports published on these subjects. Owing to Mr. Robertson's frequent and unavoidable absence in pursuance of his other duties, a part of the work which usually devolves on the agriculturist has been carried on by the Director aided by the farm foreman and by Mr. Wm. Macoun, who discharges the duty of foreman of forestry and assistant in experimental work. The important work carried on by Mr. Robertson as Dairy Commissioner for the Dominion has already influenced most favourably the dairy exports of this country and the stimulus which he has given to this industry by the establishment of experimental dairy stations and winter creameries, by his personal efforts and those of the Assistant Dairy Commissioner in Quebec, together with those of the instructors under his charge, will doubtless result in a still greater development of this extensive industry in every province of the Dominion. Full particulars of this work are given in the reports of the Dairy Commissioner.

In connection with the establishment and supervision of the experimental farms, the writer has travelled since October, 1886, eight times to the Pacific coast and ten times to the Atlantic, and visited a large proportion of the more important agricultural districts throughout the Dominion. In all branches of the work undertaken he has been greatly aided by the faithful services of those who have been associated with him and in charge of special departments and to the value of their work he desires to bear grateful testimony, and with their help these establishments have been brought to their present position of usefulness and popularity.

DISTRIBUTION OF SEED GRAIN.

Under instructions of the Hon. Minister of Agriculture this useful department of work has been continued and a very large number of requests from farmers complied with. Some of the more valuable varieties of grain distributed in sample bags among farmers for test during the past three or four years are now becoming the leading sorts in cultivation in many districts and are resulting in increased and more profitable crops.

The samples sent out during the early months of 1892, were distributed as follows:

Prince Edward Island.

Wheat	93
Oats	83
Barley	68
Pease	10
Indian corn	31
Potatoes	19
	304

Number of applicants supplied, 134.

Nova Scotia.

Oats	376
Barley	260
Wheat	204
Pease	20
Potatoes	100
Indian corn	60
	1,020

Number of applicants supplied, 552.

New Brunswick.

Oats	263
Wheat	193
Barley	189
Pease	40
Spring rye	6
Indian corn	446
Potatoes	88
	1,225

Number of applicants supplied, 759.

Ontario.

Oats	1,302
Wheat	936
Barley	890
Pease	192
Spring rye	10
Indian corn	200
Potatoes	104
	3,634

Number of applicants supplied, 1,547.

Quebec.

Oats	2,554
Barley	2,001
Wheat	1,960
Pease	396
Spring rye	2
Potatoes	939
Indian corn	665
	8,517

Number of applicants supplied, 5,282.

Manitoba.

Oats	280
Wheat	204
Barley	178
Pease	16
Potatoes	16
Indian corn	12
	706

Number of applicants supplied, 305.

North-west Territories.

Oats	351
Barley	263
Wheat	212
Pease	37
Spring rye	18
Indian corn	43
Potatoes	9
	933

Number of applicants supplied, 350.

British Columbia.

Oats	175
Wheat	152
Barley	140
Pease	8
Indian corn	88
Potatoes	3
	566

Number of applicants supplied, 185.

The following list shows the number of three-pound packages of the different varieties which have been distributed:—

Oats.

Banner	2,123
Prize Cluster	1,226
Flying Scotchman	739
Royal Doncaster	451
Bonanza	348
Holstein prolific	232
Rosedale	217
Black Tartarian	48
	5,384

Wheat.

Campbell's white chaff	2,002
Ladoga	913
Judket	299
Red Fife	188
Rio Grande	186
Red Connell	169
Johnston's Defiance	169
Indian Hard Calcutta	27
Red Fern	1
	3,954

Barley—Two-rowed.

Kinver Chevalier	1,694
Goldthorpe	1,558
Prize Prolific	310
Saale	233
	3,795

Barley—Six-rowed.

Baxter's Six-rowed	159
Rennie's Improved	35
	194

Pease.

Mummy	393
Pride	197
Multiplier	50
Black Marrowfat	49
White Marrowfat	30
	719

Rye.

Spring rye	36

Indian Corn.

Pearce's Prolific	720
Rural Thoroughbred White Flint	714
Longfellow	94
Mitchell's Early	17
	1,545

Potatoes.

Early Ohio	324
Lee's Favourite	234
Algoma Seedling No. 2	130
Wonder of the World	120
Daisy	120
Thorburn	92
May Queen	74
Chicago Market	66
Beauty of Hebron	52
Early Sunrise	32
Holborn Abundance	28
Rural Blush	6
	1,278

Total number of samples distributed	16,905
Number of applicants supplied	9,114

REPORTS RECEIVED FROM SAMPLES DISTRIBUTED.

Banner Oats.

Prince Edward Island.—Number of reports received, 5; average yield from 3 lbs., 106½ lbs.; average weight per bushel, 36 lbs. The largest crop was 168 lbs., grown by J. A. Gallant, of Fifteen Point, and weighed 37 lbs. per bushel. The heaviest sample received from this province was grown by P. Chiasson, of Tignish, and weighed 41¼ lbs. per bushel.

Nova Scotia.—Number of reports received, 33; average yield from 3 lbs., 53½ lbs.; average weight per bushel, 33¾ lbs. The largest crop was 90 lbs., grown by R. McNeill, of Big Beach, no sample was received. The heaviest sample received from this province was grown by Neil McNeill, of Shubenacadie, and weighed 38½ lbs. per bushel.

New Brunswick.—Number of reports received, 29; average yield from 3 lbs., 64½ lbs.; average weight per bushel, 34⅓. The largest crop was 127 lbs., grown by J. R. Taylor, of Rockland, no sample was received. The heaviest sample was grown by A. McKay, of Kincardine, and weighed 38 lbs. per bushel.

Quebec.—Number of reports received, 159; average yield from 3 lbs., 63¼ lbs.; average weight per bushel, 33¾ lbs. The largest crop was 210lbs., grown by N. Dupont, sen., St. Sévère, and weighed 33 lbs. per bushel. The heaviest sample received from this province was grown by I. Lortie, of Ste. Justine de Newton, and weighed 41¾ lbs. per bushel.

Ontario.—Number of reports received, 44; average yield from 3 lbs., 72; average weight per bushel, 33¼ lbs. The largest crop was 170 lbs., grown by H. Allard, of Nosbonsing, and weighed 36½ lbs. per bushel. The heaviest sample received from this province was grown by J. P. Bradshaw, of Bar River, and weighed 38¾ lbs. per bushel.

Manitoba.—Number of reports received, 13; average yield from 3 lbs., 67 lbs.; average weight per bushel, 34½ lbs. The largest crop was 142 lbs., grown by A. J. Cotton, of Treherne, and weighed 35 lbs. per bushel. The heaviest sample received from this province was grown by J. Connor, of Mowbray, and weighed 39¼ lbs. per bushel.

North-west Territories.—Number of reports received, 7; average yield from 3 lbs., 50 lbs.; average weight per bushel, 37 lbs. The largest crop was 98 lbs., grown by H. Harris of Yorkton, he also had the heaviest sample weighing 39¼ lbs. per bushel.

British Columbia.—Number of reports received, 13; average yield from 3 lbs. $109\frac{1}{3}$ lbs.; average weight per bushel, $37\frac{1}{2}$ lbs. The largest crop was 360 lbs., grown by T. G. McCormick, of Vernon, but no sample of this was received. The heaviest sample received was grown by D. Matheson, of Spallmacheen, and weighed 41 lbs. per bushel.

Prize Cluster Oats.

Prince Edward Island.—Number of reports received, 5; average yield from 3 lbs., $63\frac{1}{2}$ lbs.; average weight per bushel, $39\frac{1}{4}$ lbs. The largest crop was 83 lbs. grown by S. Dawson of Quyon, and weighed 36 lbs. per bushel. The heaviest sample was grown by J. T. Pickering, of Stanley Bridge, and weighed $43\frac{1}{2}$ lbs. per bushel.

Nova Scotia.—Number of reports received, 12; average yield from 3 lbs. $46\frac{3}{4}$ lbs.; average weight per bushel, 38 lbs. The largest crop was 92 lbs., grown by J. Slade, of Tatamagouche. This was, also, the heaviest sample received and weighed $40\frac{3}{4}$ lbs. per bushel.

New Brunswick.—Number of reports received, 22; average yield from 3 lbs., 61 lbs.; average weight per bushel, $39\frac{1}{2}$ lbs. The largest crop was 159 lbs. grown by W. Cunningham of Upper Caverhill and weighed $39\frac{1}{2}$ lbs. per bushel. The heaviest sample was grown by H. H. Chiasson, of St. Louis de Kent, and weighed $43\frac{3}{4}$ lbs. per bushel.

Quebec.—Number of reports received, 93; average yield from 3 lbs., $63\frac{3}{4}$ lbs.; average weight per bushel, $38\frac{1}{4}$ lbs. The largest crop was 200 lbs., grown by A. St. Onge of Bécancour, and weighed $29\frac{1}{2}$ lbs. per bushel. The heaviest sample was grown by P. Soucy, of St. Léon de Stanton, and weighed 44 lbs. per bushel.

Ontario.—Number of reports received, 51; average yield from 3 lbs., $62\frac{1}{2}$ lbs.; average weight per bushel, $38\frac{1}{3}$ lbs. The largest crop was 130 lbs., grown by M. Waniker, of Round Lake, and weighed 40 lbs. per bushel. The heaviest sample was grown by E. Wright, of Lindsay, and weighed $42\frac{1}{2}$ lbs. per bushel.

Manitoba.—Number of reports received, 8; average yield from 3 lbs., 42 lbs.; average weight per bushel, $40\frac{1}{2}$ lbs. The largest crop was 63 lbs., grown by A. Lundgrew of Scandinavia, and weighed 42 lbs. per bushel. This was also the heaviest sample received from Manitoba.

North-west Territories.—Number of reports received, 5; average yield from 3 lbs., 27 lbs.; average weight per bushel, $37\frac{1}{2}$ lbs. The largest crop was 40 lbs., grown by F. Nicholson, of Perley, and weighed $39\frac{3}{4}$ lbs. per bushel. The heaviest sample was grown by R. Smith & Son, of Prince Albert, and weighed $40\frac{1}{4}$ lbs.

British Columbia.—Number of reports received, 5; average yield from 3 lbs., $57\frac{1}{2}$ lbs.; average weight per bushel, $41\frac{1}{4}$ lbs. The largest crop was 100 lbs., grown by T. Degnen of Gabriolia Island, and weighed $44\frac{1}{4}$ lbs. per bushel; this was also the heaviest sample received.

Flying Scotchman Oats.

Prince Edward Island.—Number of reports received, 3; average yield from 3 lbs., $51\frac{2}{3}$ lbs.; average weight per bushel, 38 lbs. The largest crop was 68 lbs., grown by A. A. Moore, of Pownall, and weighed $39\frac{1}{2}$ lbs. per bushel. This was the heaviest sample received from this province.

Nova Scotia.—Number of reports received, 6; average yield from 3 lbs., $61\frac{3}{4}$ lbs.; average weight per bushel, 35 lbs. The largest crop was 104 lbs., grown by Robt. Smith, of Pugwash, and weighed 38 lbs. per bushel. This was also the heaviest sample received from this province.

New Brunswick.—Number of reports received, 9; average yield from 3 lbs., $66\frac{4}{9}$ lbs.; average weight per bushel, $36\frac{3}{4}$ lbs. The largest crop was 92 lbs., grown by I. J. Brown, of Canterbury Station, and weighed $34\frac{3}{4}$ lbs. per bushel. The heaviest sample received from this province was grown by M. Dugas, of Grande Anse, and weighed $39\frac{1}{2}$ lbs. per bushel.

Quebec.—Number of reports received, 46; average yield from 3 lbs., $61\frac{3}{4}$ lbs.; average weight per bushel, $35\frac{3}{4}$ lbs. The largest crop was 171 lbs., grown by D.

Gaudette, of Joliette, and weighed 31½ lbs. per bushel. The heaviest sample received from this province was grown by H. Vincent, of St. Canute, and weighed 40½ lbs. per bushel.

Ontario.—Number of reports received, 29; average yield from 3 lbs., 77¼ lbs.; average weight per bushel, 37 lbs. The largest crop was 138 lbs., grown by Wm. Kirk of Paisley, and weighed 37½ lbs. per bushel. The heaviest sample received from this province was grown by Jas. Bates, of North Glanford, and weighed 40½ lbs. per bushel.

Manitoba.—Number of reports received, 5; average yield from 3 lbs., 76½ lbs.; average weight per bushel, 36 lbs. The largest crop was 110 lbs., grown by John Gowell, of Carberry, no sample received. The heaviest sample received from this province was grown by A. Lundgrew, of Scandinavia, and weighed 39¾ lbs. per bushel.

North-west Territories.—Number of reports received, 6; average yield from 3 lbs., 43½ lbs.; average weight per bushel, 36½ lbs. The largest crop was 52 lbs., grown by F. J. Houghton, of Cannington Manor, and weighed 35 lbs. per bushel. The heaviest sample received from the Territories was grown by B. Harvey, of Saltcoats, and weighed 41 lbs. per bushel.

British Columbia.—Number of reports received, 2; average yield from 3 lbs., 67 lbs.; average weight per bushel, 38 lbs. The largest crop was 100 lbs., grown by J. R. Grey, of Langley. No sample was received. The heaviest sample received from this province was grown by Wm. Issac, of Port Hammond, and weighed 38 lbs. per bushel.

Royal Doncaster Oats.

Prince Edward Island.—Number of reports received, 2; average yield from 3 lbs., 47½ lbs.; average weight per bushel, 35 lbs. The largest crop was 55 lbs., grown by H. McQueen, of Orwell, who also had the heaviest sample, weighing 37¼ lbs. per bushel.

Nova Scotia.—Number of reports received, 5; average yield from 3 lbs., 47½ lbs.; average weight per bushel, 35¼ lbs. The largest crop was 55 lbs., grown by J. Cummings, of Pugwash, and weighed 37 lbs. per bushel. The heaviest sample was grown by Donald McRae, of Baddeck, and weighed 38 lbs. per bushel.

New Brunswick.—Number of reports received, 6; average yield from 3 lbs., 51 lbs.,; average weight per bushel, 39 lbs. The largest crop was 106 lbs., grown by by Mr. Cyr, of St. Leonard, and weighed 40 lbs. per bushel. The heaviest sample was grown by J. Findlay, of Upper Kintore, and weighed 41 lbs. per bushel.

Quebec.—Number of reports received, 16; average yield from 3 lbs., 58½ lbs.; average weight per bushel, 36¼ lbs. The largest crop was 108 lbs., grown by J. Parent, of Charlesbourg, and weighed 34½ lbs. per bushel. The heaviest sample was grown by A. Lachance, of Sacré Cœur de Marie, and weighed 40½ lbs. per bushel.

Ontario.—Number of reports received, 15; average yield from 3 lbs., 70 lbs., average weight per bushel 36 lbs. The largest crop was 125 lbs., grown by T. Manderson of Myrtle and weighed 35¼ lbs. per bushel. The heaviest sample was grown by W. Merkley of Irena and weighed 40 lbs. per bushel.

Manitoba.—Number of reports received, 4; average yield from 3 lbs., 72¼ lbs., average weight per bushel, 32¾ lbs. The largest crop was 78 lbs., grown by B. Prefontaine of St. Eustache and weighed 31 lbs. per bushel. The heaviest sample was grown by J. Barclay of Morris and weighed 36 lbs. per bushel.

North-west Territories.—No reports yet received.

British Columbia.—Number of reports received 2, only one of these gave the yield, from 3 lbs., 28½ lbs., this was grown by J. M. Webster of Webster's Corners and weighed 38½ lbs. per bushel.

Bonanza Oats.

New Brunswick.—Number of reports received, 2; average yield from 3 lbs., 65 lbs.; average weight per bushel, 40¾ lbs. The largest crop was 88 lbs., grown by H. Duthie of Kincardine. This also was the heaviest sample, and weighed 43½ lbs. per bushel.

Quebec.—Number of reports received, 26; average yield from 3 lbs., 57½ lbs.; average weight per bushel 39¾ lbs. The largest crop was 120 lbs. grown by F. Bolduc of St. Henri, and weighed 39 lbs. per bushel. The heaviest sample was grown by A. Vaillancourt of Ste. Perpetue, and weighed 46¼ lbs. per bushel.

Ontario.—Number of reports received, 9; average yield from 3 lbs., 54 lbs.; average weight per bushel, 38¾ lbs. The largest crop was 96 lbs., grown by C. Jones of Hillier, and weighed 40 lbs. per bushel. The heaviest sample was grown by J. Russell of Eady. and weighed 40¼ lbs. per bushel.

British Columbia.—One report received; yield from 3 lbs., 115 lbs.; weight per bushel 45 pounds, grown by W. Brown of Somenos.

Holstein Prolific.

Nova Scotia.—Number of reports received, 2; only one of which gives the yield; this was grown by S. Robichaud of Meteghan, and the yield from 3 lbs. was 64 lbs.; weight per bushel, 30 lbs. The other sample weighed 35 lbs. per bushel, and was grown by J. McKenzie of Rear Baddeck Bay.

New Brunswick.—Number of reports received, 2; average yield from 3 lbs., 56½ lbs.; average weight per bushel, 32½ lbs. The largest crop was 65 lbs., grown by D. Parent of Upper Queensland, and weighed 30½ lbs. per bushel. The heaviest sample was grown by J. Ellis of New Kincardine, and weighed 34 lbs. per bushel.

Quebec.—Number of reports received, 6; average yield from 3 lbs., 71½ lbs.; average weight per bushel, 34¾ lbs. The largest crop was 100 lbs., grown by G. Gagné of Maria, and weighed 34 lbs. per bushel. The heaviest sample was grown by A. LeBellois, of Magnosha, and weighed 38½ lbs. per bushel.

Ontario.—Number of samples received, 18; average yield from 3 lbs., 83 lbs.; average weight per bushel, 32¼ lbs. The largest crop was 130 lbs., grown by J. Keffer, of Ethel; sample sent was too small to weigh. The heaviest sample was grown by P. McGregor, of Rokeby, and weighed 38¼ lbs. per bushel.

Rosedale.

Prince Edward Island.—One report only was received, the yield was 79 lbs., from 3 lbs. of seed, weighing 37 lbs. per bushel; grown by E. Bearisto, of Montrose.

Quebec.—Number of reports received, 8; average yield from 3 lbs., 44½ lbs.; average weight per bushel, 38¾ lbs. The largest crop was 89 lbs., grown by N. Lambert, of St. Didace, who also had the heaviest sample, weighing 40½ lbs. per bushel.

Ontario.—Number of reports received, 12; average yield from 3 lbs., 52½ lbs.; average weight per bushel, 32½ lbs. The largest crop was 88 lbs., grown by T. Teasdale, of Concord, and weighed 33½ lbs. per bushel. The heaviest sample was grown by Wm. Stillman, of Campbellford, and weighed 39 lbs. per bushel.

Manitoba.—Number of reports received, 3; average yield from 3 lbs., 103 lbs.; average weight per bushel, 36¾ lbs. The largest crop was 130 lbs., grown by A. J. Cotton of Treherne, and weighed 35½ lbs. per bushel. The heaviest sample was grown by A. Dixon, of Dugald, and weighed 38 lbs. per bushel.

Black Tartarian.

Nova Scotia.—Number of reports received, 3; average yield from 3 lbs., 38⅓ lbs.; average weight per bushel, 29¾ lbs. The largest crop was 96 lbs., grown by F. Beaton, of Alexander, and weighed 32¾ lbs. per bushel; he also had the heaviest sample.

Ontario.—One report was received from Ontario, from R. S. Jones, of Hillier, who had a crop of 112 lbs. from 3 lbs. of seed, which weighed 33¾ lbs. per bushel.

Manitoba.—Number of reports received, 2; average yield from 3 lbs., 41 lbs.; average weight per bushel, 34¼. The largest crop was 65 lbs., grown by Wm. Allison, of Starbuck, and weighed 31½ lbs. per bushel. The heaviest sample was grown by T. Seaman, of Seamo, and weighed 37 lbs. per bushel.

WHEAT.

Campbell's White Chaff.

Prince Edward Island.—Number of reports received, 13; average yield from 3 lbs., 51½ lbs.; average weight per bushel, 58¾ lbs. The largest crop was 100 lbs., grown by J. A. Gallant, of Fifteen Point; the heaviest sample was grown by A. McLean, of Beaton's Mills, and weighed 60½ lbs. per bushel.

New Brunswick.—Number of reports received, 27; average yield from 3 lbs., 54 lbs.; average weight per bushel, 59 lbs. The largest yield was 120 lbs., grown by T. Watt, of Kintore, and weighed 53¼ lbs. per bushel; the heaviest sample was grown by J. Paterson, of Upper Kintore, and weighed 63 lbs. per bushel.

Nova Scotia.—Number of reports received, 19; average yield from 3 lbs., 45¾ lbs.; average weight per bushel, 58½ lbs. The largest crop was 91 lbs., grown by J. Killam, of Kingston, and weighed 56 lbs. per bushel; the heaviest sample was grown by J. A. Cummings, of Pugwash, and weighed 62 lbs. per bushel.

Quebec.—Number of reports received, 119; average yield from 3 lbs., 41¼ lbs; average weight per bushel, 57 lbs. The largest crop was 162 lbs., grown by T. Tremblay, of Hebertville. He also had the heaviest sample, weighing 62½ per bushel.

Ontario.—Number of reports received, 85; average yield from 3 lbs., 34½ lbs.; average weight per bushel, 55¾ lbs. The largest crop was 132 lbs., grown by Wm. Hawkins of Micksburg, and weighed 59½ lbs. per bushel. The heaviest sample was grown by A. H. Hogan, of Sowerby, and weighed 61 lbs. per bushel.

Manitoba.—Number of reports received, 4; average yield from 3 lbs., 27½ lbs.; average weight per bushel, 58½ lbs. The largest crop was 35 lbs., grown by I. Plamondon, of St. Jean-Baptiste, and weighed 53¼ lbs. per bushel. The heaviest sample was grown by A. Ferguson, of Virden, and weighed 61¾ lbs. per bushel.

North-west Territories.—Number of reports received, 3; average yield from 3 lbs., 27½ lbs.; average weight per bushel, 58½ lbs. The largest crop was 40 lbs., grown by C. Davis, of Whitewood, and weighed 60 lbs. per bushel, being the heaviest sample received.

British Columbia.—Number of reports received, 15; average yield from 3 lbs., 90 lbs.; average weight per bushel, 58½ lbs. The largest crop was 350 lbs., grown by D. Matheson, of Spallumcheen, and weighed 62¾ lbs. per bushel. The heaviest sample received was grown by O. Rentz, of French Creek, and weighed 63¼ lbs. per bushel.

Ladoga Wheat.

Prince Edward Island.—Number of reports received, 2; average yield from 3 lbs., 25½ lbs.; average weight per bushel, 60 lbs. The largest crop was 26 lbs., grown by A. McMillan, of Long Point, and weighed 60½ lbs. per bushel, being the heaviest sample received.

Nova Scotia.—Number of reports received, 7; average yield from 3 lbs., 29¾ lbs.; average weight per bushel, 58 lbs. The largest crop was 40 lbs., grown by J. J. McCharles, of South Gut, and weighed 57 lbs. per bushel. The heaviest sample was grown by D. McLennan, of South Bar, and weighed 60¾ lbs. per bushel.

New Brunswick.—Number of reports received, 7; average yield from 3 lbs., 43½ lbs.; average weight per bushel, 59¼ lbs. The largest crop was 60 lbs., grown by B. A. Chapman, of Cocagne Bridge, and weighed 61½ lbs. per bushel, being the heaviest sample received.

Quebec.—Number of reports received, 74; average yield from 3 lbs., 44 lbs.; average weight per bushel, 57¼ lbs. The largest crop was 96 lbs., grown by W. Vallier, of Agnes, and weighed 57 lbs. per bushel. The heaviest sample was grown by J. Briere, of St. Charles de Caplan, and weighed 62¾ lbs. per bushel.

Ontario.—Number of reports received, 7; average yield from 3 lbs., 37½ lbs.; average weight per bushel, 58½ lbs. The largest crop was 75 lbs., grown by G. Reid, of Bar River, and weighed 60 lbs. per bushel. The heaviest sample was grown by T. Ledstone, of Bar River, and weighed 63 lbs. per bushel.

Manitoba.—Number of reports received, 4; average yield from 3 lbs., 42 lbs.; average weight per bushel, 59½ lbs. The largest crop was 63 lbs., grown by R. H. Cathelineau, of Giroux; no sample received. The heaviest sample was grown by W. T. Bett, of Seamo, and weighed 60¼ lbs. per bushel.

North-west Territories.—Number of reports received, 4; average yield from 3 lbs., 32 lbs.; average weight per bushel, 54½ lbs. The largest crop was 57 lbs, grown by J. Cole, of Red Deer, and weighed 56¾ lbs per bushel, being the heaviest sample received.

British Columbia.—Number of reports received, 1; yield from 3 lbs., 185 lbs.; weight per bushel, 63½ lbs. Grown by J. H. Chapman, of Chilliwack, B.C.

Judket.

Prince Edward Island.—Number of reports received, 1; yield from 3 lbs., 27 lbs.; weight per bushel, 58½ lbs. Grown by E. Bearisto, of Montrose.

Nova Scotia.—Number of reports received, 1; yield from 3 lbs., 54 lbs.; weight per bushel, 58½ lbs. Grown by D. W. McFarland, of Wallace.

New Brunswick.—Number of reports received, 1; yield from 3 lbs., 25 lbs.; weight per bushel, 60¼ lbs. Grown by L. Gosselin, of Sweeneyville.

Quebec.—Number of reports received, 24; average yield from 3 lbs., 44½ lbs.; average weight per bushel, 57 lbs. The largest crop was 81 lbs., grown by G. St. Amand, of St. Joseph de LePage; no sample received. The heaviest sample was grown by G. Sutherland, of L'Avenir, and weighed 60¾ lbs. per bushel.

Ontario.—Number of reports received, 9; average yield from 3 lbs., 25½ lbs.; average weight per bushel, 57¾ lbs. The largest crop was 47 lbs., grown by J. Bradshaw, of Bar River, Ont., and weighed 58½ lbs. per bushel. The heaviest sample was grown by C. Ouellette, of Eastman's Springs, and weighed 59 lbs. per bushel.

Manitoba.—Number of reports received, 7; average yield from 3 lbs., 50 lbs.; average weight per bushel, 58 lbs. The largest crop was 75 lbs., grown by A. Cotton, of Treherne, and weighed 60 lbs. per bushel, being the heaviest sample received.

Red Fife.

Prince Edward Island.—No reports received.

Nova Scotia.—Number of reports received, 1; yield from 3 lbs., 46 lbs.; weight per bushel, 59¾ lbs. Grown by A. J. Cummings, of Pugwash.

New Brunswick.—Number of reports received, 2; average yield from 3 lbs., 47 lbs.; weight per bushel of one sample received, 62¾ lbs. The largest crop was 61¼ lbs., grown by H. Duthie, of Kincardine. No sample received. The heaviest sample was grown by J. Cannon, of Upper Kintore, and weighed 62¾ lbs. per bushel.

Quebec.—Number of reports received, 7; average yield from 3 lbs., 70½ lbs.; average weight per bushel, 60¼ lbs. The largest crop was 160 lbs., grown by the Trappist Fathers of Oka, and weighed 57¾ lbs. per bushel. The heaviest sample was grown by G. Whetton, of Paspebiac, and weighed 62¼ lbs. per bushel.

Ontario.—Number of reports received, 1; yield from 3 lbs., 30 lbs.; weight per bushel, 57¼ lbs. Grown by T. Boucher, of St. Thomas.

Manitoba.—Number of reports received, 9; average yield from 3 lbs., 52⅓ lbs.; average weight per bushel, 59½ lbs. The largest crop was 125½ lbs., grown by A. V. Brunker, of St. Jean Baptiste, and weighed 61¼ lbs. per bushel. The heaviest sample was grown by Z. Gaudbout, of Carleton West, and weighed 63 lbs. per bushel.

Rio Grande.

Prince Edward Island.—Number of reports received, 2; average yield from 3 lbs., 39 lbs.; average weight per bushel, 60¼ lbs. The largest crop was 44 lbs., grown by A. A. Moore, of Pownall, and weighed 60 lbs. per bushel. The heaviest sample was grown by N. McDonald, of Hampton, and weighed 60½ lbs. per bushel.

Nova Scotia.—Number of reports received, 3; average yield from 3 lbs., 28 lbs.; average weight per bushel, 59 lbs. The largest crop was 30 lbs., grown by M. McGillis, of North Gut, St. Ann's, and weighed 60¼ lbs. per bushel, being the heaviest sample received.

New Brunswick.—Number of reports received, 2; average yield from 3 lbs., 24 lbs.; average weight per bushel, 64½ lbs. The largest crop was 25 lbs., grown by T. Bobineau, of Cocagne. No sample received. The heaviest sample was grown by C. L. Cogan, of Cocagne River, and weighed 64½ lbs. per bushel.

Quebec.—Number of reports received, 11; average yield from 3 lbs., 39½ lbs.; average weight per bushel, 59½ lbs. The largest crop was 75 lbs., grown by A. Hebert, of St. Félicien, and weighed 60 lbs. per bushel. The heaviest sample was grown by A. Houde, of Baie St. Paul, and weighed 62 lbs. per bushel.

Ontario.—Number of reports received, 8; average yield from 3 lbs., 25 lbs.; average weight per bushel, 59¼ lbs. The largest crop was 47 lbs., grown by N. Colville, of Leskard, Ont., and weighed 60¾ lbs., per bushel. The heaviest sample was grown by W. S. Bain, of Beaverton, and weighed 61 lbs. per bushel.

Manitoba.—Number of reports received, 2; average yield from 3 lbs., 35 lbs., average weight per bushel, 61½ lbs. The largest crop was 35 lbs., grown by J. Plamondon, of St. Jean-Baptiste, and weighed 61½ lbs. per bushel, being the heaviest sample received.

Red Connell.

New Brunswick.—Number of reports received, 2; average yield from 3 lbs., 75 lbs., average weight per bushel, 56½ lbs. The largest crop was 114 lbs., grown by Thos. Watt, of Kintore, and weighed 53¾ lbs. per bushel. The heaviest sample was grown by D. A. Gognem, of Cocagne River, and weighed 59 lbs. per bushel.

Ontario.—Number of reports received, 2; average yield from 3 lbs., 46 lbs.; average weight per bushel, 59¼ lbs. The largest crop was 52 lbs., grown by A. Boldt, of Kinmount, and weighed 59¼ lbs. per bushel, being the heaviest sample received.

North-west Territories.—Number of reports received, 1; yield from 3 lbs., 40 lbs. weight per bushel, 59½ lbs. Grown by B. Harvey, of Saltcoats.

Johnston's Defiance.

New Brunswick.—Number of reports received, 1; yield from 3 lbs, 54 lbs.; weight per bushel, 58½ lbs. Grown by M. Cyr, of St. Leonard.

Quebec.—Number of reports received, 14; average yield from 3 lbs, 39⅓ lbs., average weight per bushel, 57 lbs. The largest crop was 87 lbs., grown by N. Dupont (père) of St. Sévère, and weighed 62½ lbs. per bushel, being the heaviest sample received.

Indian Hard Calcutta.

Manitoba.—Number of reports received, 1; yield from 3 lbs, 45 lbs.; weight per bushel, 60¼ lbs. Grown by J. T. Barclay, of Morris.

BARLEY.

Kinver Chevalier.

Prince Edward Island.—Number of reports received, 7; average yield from 3 lbs., 55 lbs.; average weight per bushel, 48½ lbs. The largest crop was 80 lbs., grown by W. Clark, of North Wiltshire, and weighed 49½ lbs. per bushel. The heaviest sample was grown by J. T. Pickering, of Stanley Bridge, and weighed 51¾ lbs. per bushel.

Nova Scotia.—Number of reports received, 10; average yield from 3 lbs., 44½ lbs.; average weight per bushel, 48½ lbs. The largest crop was 53 lbs., grown by J. J. Hern, of Grande Anse, and weighed 53 lbs. per bushel, being the heaviest sample received.

New Brunswick.—Number of reports received, 8; average yield from 3 lbs., 36½ lbs.; average weight per bushel, 48 lbs. The largest crop was 49 lbs., grown by P. Machray, of Kintore, and weighed 50¼ lbs. per bushel. The heaviest sample was grown by L. Gosselin, of Sweeneyville, and weighed 53 lbs. per bushel.

Quebec.—Number of reports received, 107; average yield from 3 lbs., 39 lbs.; average weight per bushel, 45¼ lbs. The largest crop was 130 lbs., grown by H. Legault (Maire), of St. Geneviève, and weighed 48¾ lbs. per bushel. The heaviest sample was grown by A. Labillois, of St. Jean l'Evangéliste, and weighed 53 lbs. per bushel.

Ontario.—Number of reports received, 29; average yield from 3 lbs., 41½ lbs.; average weight per bushel, 48 lbs. The largest crop was 145 lbs., grown by J. Renwick, of Lakehurst, and weighed 49 lbs. per bushel. The heaviest sample was grown by Wm. Stillman, of Campbellford, and weighed 52 lbs. per bushel.

Manitoba.—Number of reports received, 10; average yield from 3 lbs., 46 lbs.; average weight per bushel, 50¾ lbs. The largest crop was 73 lbs., grown by A. J. Cotton, of Treherne, and weighed 49¾ lbs. per bushel. The heaviest sample was grown by S. Finnegan, of Bonnie Doon, and weighed 53 lbs. per bushel.

North-west Territories.—Number of reports received, 6; average yield from 3 lbs., 40 lbs.; average weight per bushel, 49 lbs. The largest crop was 50 lbs., grown by C. Davis, of Whitewood, and weighed 53½ lbs. per bushel, being the heaviest sample received.

British Columbia.—Number of reports received, 7; average yield from 3 lbs., 64 lbs.; average weight per bushel, 50 lbs. The largest crop was 98 lbs., grown by J. McConnell, of Chilliwack, and weighed 50¾ lbs. per bushel. The heaviest sample was grown by A. Debeault, of Alberni, and weighed 52¼ lbs. per bushel.

Goldthorpe.

Prince Edward Island.—Number of reports received, 4; average yield from 3 lbs., 39¼ lbs.; average weight per bushel, 49¼ lbs. The largest crop was 60 lbs., grown by W. H. Cread, of Sturgeon, and weighed 50½ lbs. per bushel, being the heaviest sample received.

Nova Scotia.—Number of reports received, 10; average yield from 3 lbs., 46½ lbs; average weight per bushel, 47¾ lbs. The largest crop was 116 lbs, grown by R. Smith, of Pugwash. and weighed 46¼ lbs per bushel. The heaviest sample was grown by F. Collins, of McLennan's Mountain, and weighed 52 lbs. per bushel.

New Brunswick.—Number of reports received, 15; average yield from 3 lbs., 41¾ lbs.; average weight per bushel, 50½ lbs. The largest crop was 88 lbs., grown by J. R. Taylor, of Rockland. and weighed 53½ lbs. per bushel. The heaviest sample was grown by A. Philip, of Upper Kintore, and weighed 53¾ lbs. per bushel.

Quebec.—Number of reports received, 56; average yield from 3 lbs., 45¾ lbs.; average weight per bushel, 47 lbs. The largest crop was 108 lbs., grown by J. Dumais, of Baie des Pères, and weighed 51 lbs. per bushel. The heaviest sample was grown by J. Bte. Rossignol, of St. Louis, Lake St. John, and weighed 53¼ lbs. per bushel.

Ontario.—Number of reports received, 55; average yield from 3 lbs., 42¾ lbs.; average weight per bushel, 47½ lbs. The largest crop was 115 lbs., grown by Jas. Exon, of Haliburton, and weighed 50¼ lbs. per bushel. The heaviest sample was grown by Wm. Stillman, of Campbellford, and weighed 53¼ lbs. per bushel.

Manitoba.—Number of reports received, 10; average yield from 3 lbs., 56½ lbs.; average weight per bushel, 49½ lbs. The largest crop was 100 lbs., grown by J. Charles, of Oak Lake, and weighed 52 lbs. per bushel. The heaviest sample was grown by D. Chalmers, of Richland, and weighed 52½ lbs. per bushel.

North-west Territories.—Number of reports received, 5; average yield from 3 lbs., 84½ lbs.; average weight per bushel, 50 lbs. The largest crop was 102 lbs., grown by J. Newhart, of Fort Saskatchewan, and weighed 52 lbs. per bushel, being the heaviest sample received.

British Columbia.—Number of reports received, 9; average yield from 3 lbs., 51⅓ lbs.; average weight per bushel, 51¾ lbs. The largest crop was 96 lbs., grown

by W. C. Brown, of Somenos, and weighed 52 lbs. per bushel. The heaviest sample was grown by N. Gaetzen, of French Creek, and weighed 54 lbs. per bushel.

Prize Prolific.

Prince Edward Island.—Number of reports received, 1; yield from 3 lbs., 30 lbs.; weight per bushel, 49½ lbs. Grown by F. Gallant, of Cape Egmont.

Nova Scotia.—Number of reports received, 3; average yield from 3 lbs., 62 lbs.; average weight per bushel, 48½ lbs. The largest crop was 100 lbs., grown by J. Slade, of West Tatamagouche, and weighed 53¼ lbs. per bushel, being the heaviest sample received.

New Brunswick.—Number of reports received, 4; average yield from 3 lbs., 22¼ lbs.; average weight per bushel, 43½ lbs. The largest crop was 40 lbs., grown by W. Cunningham, of Upper Caverhill, and weighed 42½ lbs. per bushel. The heaviest sample was grown by A. Brown, of Corn Hill, and weighed 44¾ lbs. per bushel.

Quebec.—Number of reports received, 23; average yield from 3 lbs., 34½ lbs.; average weight per bushel, 46½ lbs. The largest crop was 72 lbs., grown by M. Girard, of St. Jean de Matha, and weighed 48 lbs. per bushel. The heaviest sample was grown by W. Cascadden, of Asbestos, and weighed 51½ lbs. per bushel.

Ontario.—Number of reports received, 4; average yield from 3 lbs., 21½ lbs.; average weight per bushel, 46¼ lbs. The largest crop was 25 lbs., grown by W. A. McCartney, of Milton West, and weighed 49½ lbs. per bushel, being the heaviest sample received.

Manitoba.—Number of reports received, 1; yield from 3 lbs., 25 lbs.; weight per bushel, 49½ lbs. Grown by W. T. Bett, of Seamo.

No reports from North-west Territories or British Columbia.

Saale.

Nova Scotia.—Number of reports received, 2; average yield from 3 lbs., 53½ lbs.; average weight per bushel, 47¼ lbs. The largest crop was 80 lbs., grown by R. McNeill, of Big Beach, and weighed 45 lbs. per bushel. The heaviest sample was grown by J. McNeill, of Big Pond, and weighed 49½ lbs. per bushel.

Quebec.—Number of reports received, 18; average yield from 3 lbs., 49 lbs.; average weight per bushel, 47½ lbs. The largest crop was 90 lbs., grown by L. Dubuc, of St. Isidore, and weighed 46¾ lbs. per bushel. The heaviest sample was grown by M. Tremblay, of St. Roch des Aulnais, and weighed 51½ lbs. per bushel.

Ontario.—Number of reports received, 2; average yield from 3 lbs., 48 lbs.; average weight per bushel, 44 lbs. The largest crop was 81 lbs., grown by J. Simpson, of Waverley, and weighed 48¾ lbs. per bushel, being the heaviest sample received.

No reports received from the other provinces.

Baxter's Six-rowed.

Prince Edward Island.—Number of reports received, 1; yield from 3 lbs., 90 lbs.; weight per bushel, 49¾ lbs., grown by G. Lenkletter, of Cape Egmont.

Nova Scotia.—Number of reports received, 3; average yield from 3 lbs., 46⅔ lbs.; average weight per bushel, 48⅓ lbs. The largest crop was 60 lbs., grown by J. G. Duncanson, of Port Hood, and weighed 48¼ lbs. per bushel, being the heaviest sample received.

New Brunswick.—Number of reports received, 1; yield from 3 lbs., 73 lbs.; weight per bushel, 46 lbs. Grown by R. Watson, of Gladstone.

Quebec.—Number of reports received, 11; average yield from 3 lbs., 48½ lbs.; average weight per bushel, 47½ lbs. The largest crop was 80 lbs., grown by T. H. Bourgeois, of St. Théodore de Chertsey, and weighed 48 lbs. per bushel. The heaviest sample was grown by C. Pelletier, of St. Octave, and weighed 51¼ lbs. per bushel.

Ontario.—Number of reports received, 4; average yield from 3 lbs., 71 lbs; average weight per bushel, 51 lbs. The largest crop was 100 lbs., grown by Thos.

Manderson, of Myrtle, and weighed 54 lbs. per bushel, being the heaviest sample received.

No reports received from the other provinces.

Rennie's Improved Six-rowed.

Quebec.—Number of reports received, 3; average yield from 3lbs., 60½ lbs.; average weight per bushel, 48⅔. The largest crop was 80 lbs., grown by A. Gerard, of St. Anselme, and weighed 48 lbs. per bushel. The heaviest sample was grown by P. Rossignol, of River du Loup, and weighed 50½ lbs. per bushel.

Ontario.—Number of reports received, 2; average yield from 3 lbs., 53 lbs.; average weight per bushel, 49 lbs. The largest crop was 62½ lbs., grown by C. L. Jones, of Hillier, and weighed 48¼ lbs. per bushel. The heaviest sample was grown by B. Kelly, of Phelpstone, and weighed 49½ lbs. per bushel.

No reports received from the other provinces.

PEASE.

Mummy.

Nova Scotia.—Number of reports received, 2; average yield from 3 lbs., 26 lbs.; average weight per bushel, 66 lbs. The largest crop was 27 lbs., grown by D. McRay, of Upper Baddeck, and weighed 66 lbs. per bushel, being the heaviest sample received.

New Brunswick.—Number of reports received, 3; average yield from 3 lbs., 45½ lbs.; average weight per bushel, 65 lbs. The largest crop was 75½ lbs., grown by J. R. Taylor, of Rockland, and weighed 65½ lbs. per bushel. The heaviest sample was grown by A. Patterson, of Kincardine, and weighed 66¼ lbs. per bushel.

Quebec.—Number of reports received, 36; average yield from 3 lbs., 36½ lbs.; average weight per bushel, 65½ lbs. The largest crop was 95 lbs., grown by H. Legault (maire) of St. Geneviève, and weighed 65 lbs. per bushel. The heaviest sample was grown by A. Bombarbier, of Baie des Pères, and weighed 67 lbs. per bushel.

Ontario.—Number of reports received, 9; average yield from 3 lbs., 35⅛ lbs.; average weight per bushel, 65 lbs.; the largest crop was 65 lbs., grown by E. Richardson, of Millbrook, and weighed 65¼ lbs. per bushel. The heaviest sample was grown by J. DeLamorandier, of Killarney, and weighed 67 lbs. per bushel.

Manitoba.—Number of reports received, 1; yield from 3 lbs., 60 lbs.; weight per bushel, 65¾ lbs. Grown by J. Harrison, of Riverville.

No reports received from the other provinces.

Pride.

Quebec.—Number of reports received, 15; average yield from 3 lbs., 33¼ lbs.; average weight per bushel, 65 lbs. The largest crop was 70 lbs., grown by A. Leclair, of St. Pamphile, and weighed 66¼ lbs. per bushel. The heaviest sample was grown by M. Jean, of St. Simon de Rimouski, and weighed 67½ lbs. per bushel.

Ontario.—Number of reports received, 7; average yield from 3 lbs., 30½ lbs.; average weight per bushel, 62½ lbs. The largest crop was 31 lbs., grown by S. Rennie, of Milliken, and weighed 63½ lbs. per bushel, being the heaviest sample received.

No reports were received from the other provinces.

Multiplier.

New Brunswick.—Number of reports received, 2; average yield from 3 lbs., 75½ lbs.; average weight per bushel, 64¾ lbs. The largest crop was 93 lbs., grown by W. G. Cunningham, of Upper Caverhill, and weighed 64½ lbs. per bushel. The heaviest sample was grown by J. J. Hern, of Grande Anse, and weighed 65 lbs. per bushel.

Quebec.—Number of reports received, 1; yield from 3 lbs., 12 lbs.; weight per bushel, 65¼ lbs. Grown by A. Ouellet, of St. Louis de Ha Ha.

Ontario.—Number of reports received, 2; average yield from 3 lbs., 67 lbs.; average weight per bushel, 65 lbs. The largest crop was 70 lbs., grown by G. Morrison, of Strathavon, and weighed 65½ lbs. per bushel, being the heaviest sample received.

No reports were received from the other provinces.

Black-Eyed Marrowfat.

Quebec.—Number of reports received, 1; yield from 3 lbs. 15 lbs.; weight per bushel, 63¼ lbs., grown by T. Richard, of St. Octave.

POTATOES.

Early Ohio.

Prince Edward Island.—Number of reports received, 1; yield from 3 lbs., 50 lbs. Grown by C. Mayers, of Lake Verd.

Nova Scotia.—Number of reports received, 1; yield from 3 lbs., 41 lbs. Grown by S. Gillis, of Frisk Meadow.

Quebec.—Number of reports received, 30; average yield from 3 lbs., $53\frac{1}{5}$ lbs. The largest crop was 123 lbs., grown by Rev. J. Boulet, of St. Magloire.

Ontario.—Number of reports received, 3; average yield from 3 lbs., 62 lbs. The largest crop was 85 lbs., grown by P. J. Kyle, of Eastman's Springs.

Manitoba.—Number of reports received, 1; yield from 3 lbs., 45 lbs. Grown by V. Florentin, of Clairier.

North-west Territories.—Number of reports received, 1; yield from 3 lbs., 12 lbs. Grown by T. Laidlaw, of Rathburn.

Lee's Favourite.

New Brunswick.—Number of reports received, 2; average yield from 3 lbs., 58 lbs. The largest crop was 76 lbs., grown by G. Armstrong, of Fredericton.

Quebec.—Number of reports received, 21; average yield from 3 lbs., 52 lbs. The largest yield was 135 lbs., grown by J. L. Daigle, of St. Charles.

Ontario.—Number of reports received, 2; average yield from 3 lbs., 45 lbs. The crops of P. W. Morrison, of Vars, and A. Cochrane, of Pembroke, each weighed 45 lbs.

Algoma No. 2.

Prince Edward Island.—Number of reports received, 1; yield from 3 lbs., 35 lbs. Grown by H. McQueen, of Orwell.

Nova Scotia.—Number of reports received, 5; average yield from 3 lbs., $57\frac{3}{5}$ lbs. The largest crop was 100 lbs., grown by D. W. G. Stevens, of Merland.

New Brunswick.—Number of reports received, 3; average yield from 3 lbs., $22\frac{2}{3}$ lbs. The largest crop was 36 lbs., grown by T. Watt, of Kintore.

Quebec.—Number of reports received, 1; yield from 3 lbs., 30 lbs. Grown by E. Legros, of St. Pamphile.

Ontario.—Number of reports received, 2; average yield from 3 lbs., 31 lbs. The largest crop was 32 lbs., grown by W. Doyle, of Bray's Crossing.

Wonder of the World.

Quebec.—Number of reports received, 19; average yield from 3 lbs., 52½ lbs. The largest crop was 139 lbs., grown by Rev. L. Douth, of St. Leonard d'Aston.

Ontario.—Number of reports received, 3; average yield from 3 lbs., $55\frac{1}{3}$ lbs. The largest crop was 73 lbs., grown by W. Murray, of McLennan.

Daisy.

Prince Edward Island.—Number of reports received, 1; yield from 3 lbs., 120 lbs., grown by J. W. McDonald, of St. Peter's Bay.

Nova Scotia.—Number of reports received, 2; average yield from 3 lbs, 50 lbs. The largest crop was 55 lbs., grown by D. McLennan, of Middle River.

New Brunswick.—Number of reports received, 1; yield from 3 lbs., 52 lbs., grown by A. Smith, of Glen Anglin.

Quebec.—Number of reports received, 14; average yield from 3 lbs., 41 lbs. The largest crop was 110 lbs., grown by J. Nantel, of Chute aux Iroquois.

Ontario.—Number of reports received, 1; yield from 3 lbs., 32 lbs., grown by T. Luckham, of Birnam.

Thorburn.

Nova Scotia.—Number of reports received, 4; average yield from 3 lbs., 39¼ lbs. The largest crop was 60 lbs., grown by D. McRae, of Baddeck.

New Brunswick.—Number of reports received, 1; yield from 3 lbs., 120 lbs., grown by Wm. Charters, of Upper Maugerville.

Quebec.—Number of reports received, 8; average yield from 3 lbs., 38½ lbs. The largest crop was 65 lbs., grown by A. Fortin, of St. Jérôme, Lake St. John.

Ontario.—Number of reports received, 1; yield from 3 lbs., 95 lbs., grown by A. J. Kyle, of Eastman's Springs.

May Queen.

New Brunswick.—Number of reports received, 2; average yield from 3 lbs., 60 lbs. The largest crop was 90 lbs., grown by H. E. Northrup, of Kingston.

Quebec.—Number of reports received, 2; average yield from 3 lbs., 31 lbs. The largest crop was 32 lbs., grown by A. G. Moreau, of Ste. Marguerite.

Chicago Market.

Quebec.—Number of reports received, 5; average yield from 3 lbs., 38 lbs. The largest crop was 90 lbs., grown by J. Elliott, of St. Paulin.

Ontario.—Number of reports received, 1; yield from 3 lbs., 35 lbs., grown by J. S. Ryan, of Head Lake.

Manitoba.—Number of reports received, 1; yield from 3 lbs., 75 lbs. Grown by J. Plamondon, of St. Jean Baptiste.

Beauty of Hebron.

Nova Scotia.—Number of reports received, 1; yield from 3 lbs., 95 lbs., grown by D. W. G. Stevens, of Merland.

Quebec.—Number of reports received, 3; average yield from 3 lbs., 50⅓ lbs. The largest crop was 75 lbs., grown by E. Dupont, of St. Sévère.

Early Sunrise.

Quebec.—Number of reports received, 7; average yield from 3 lbs., 88 lbs. The largest crop was 130 lbs., grown by Rev. E. Douth, of St. Leonard.

Rural Blush.

Nova Scotia.—Number of reports received, 1; yield from 3 lbs. 53 lbs., grown by J. Gillis, of Port Hood.

Ontario.—Number of reports received, 1; yield from 3 lbs. 85 lbs., grown by S. J. Ryan, of Head Lake.

EXPERIMENTS WITH OATS.

During the season of 1892, 52 varieties of oats have been tested at the Central Experimental Farm, 31 of which have been grown as field crops, the remainder in smaller plots. Twenty-four of these varieties were sown side by side all on the same day, on plots of one-twentieth of an acre each, with the view of ascertaining their

relative earliness and productiveness under similar conditions, the results are given in the appended table. The soil was dark sandy loam, which received a dressing of Royal Canadian fertilizer, 400 lbs. per acre, in the spring of 1892; the land was ploughed late in the autumn of 1891: disc harrowed twice in the spring of 1892, and once with smoothing harrow.

Test of Varieties of Oats, all sown same day.

Variety.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Yield per Acre.	Weight per Bushel.
				Bush. Lbs.	Lbs.
Rosedale	April 26	Aug. 8	104	64 24	38½
American Banner	do 26	do 8	104	63 18	36
Rennie's Prize White	do 26	do 1	97	63 18	41¾
Cave	do 26	do 9	105	63 2	35¾
Abyssinia	do 26	do 8	104	61 26	39¼
Golden Beauty	do 26	do 8	104	60 08	35¾
Wide-awake	do 26	do 8	104	59 32	35¾
Holstein Prolific	do 26	do 14	110	59 18	36¼
American Beauty	do 26	do 8	104	54 24	36
Early Gothland	do 26	do 8	104	54 24	38¾
Improved Ligowo	do 26	do 9	105	52 32	37
Oderbruch	do 26	do 15	111	51 26	33¾
Siberian	do 26	do 15	111	51 6	34
White Dutch	do 26	do 1	97	50 00	38¾
Joanette	do 26	do 10	106	48 28	37¾
Hazlett's Seizure	do 26	July 31	96	48 8	40¾
Giant White Side	do 26	Aug. 14	110	46 23	31
Early Archangel	do 26	do 7	103	46 2	41½
Royal Doncaster Prize	do 26	do 14	110	46 1	36¼
Abundance	do 26	do 14	110	45 30	33¼
Giant Cluster	do 26	do 15	111	45 10	32
Black Tartarian, Prolific	do 26	do 10	106	44 24	33½
Prize Cluster	do 26	do 7	103	40 14	40
Challenge White, Canadian	do 26	do 6	102	34 11	41

Records of Larger Field Plots.

American Beauty.—On sandy loam; previous crop was corn; manured in spring of 1890. Land ploughed in spring of 1892; harrowed twice; 1⅓ acres; sown April 21st; 1¾ bushels per acre; ripe, August 5th; time to mature, 106 days; yield per acre, 47 bushels; weight per bushel, 37½ lbs.; oat long, yellowish; length of panicle, 7 to 9 inches; branching; length of straw, 39 to 42 inches; moderately coarse, standing fairly well on high land and very badly lodged on low land; almost destroyed by rust on low land; not so bad on high land.

Abyssinia.—Onl ight, sandy soil; previous crop was Banner oats manured in spring of 1892. Ploughed in spring of 1892 and harrowed with smoothing harrow twice; ½ acre; sown April 29th, 1½ bushels per acre; ripe, August 8th; time to mature, 101 days; yield per acre, 34 bushels and 16 lbs.; weight per bushel, 39¼ lbs.; Oat short to medium, plump and white; length of panicle, 7 to 9 inches; branching; length of straw, 36 to 40 inches; standing well; stem considerably rusted.

Abundance.—On sandy loam; previous crop was two-rowed barley; ploughed in autumn of 1891; disc harrowed twice, and with smoothing harrow once in spring of 1892; ¾ acre; sown April 30th; 2½ bushels per acre; ripe, August 7th and 8th; time to mature, 99 days; yield per acre, 34 bushels and 25 lbs.; weight per bushel, 33½ lbs.; Oat long, rather slender, yellowish white; length of panicle, 7 to 9 inches; branching; length of straw, 40 to 44 inches; medium coarse; badly lodged; stem considerably rusted.

Bonanza.—On sandy loam. Previous crop was corn; manured in spring of 1890; ploughed spring of 1892; harrowed twice; ½ acre; sown April 21st; 1½

bushels per acre; ripe, July 29th; time to mature, 99 days; yield per acre, 47 bushels and 21 lbs.; weight per bushel, $43\frac{1}{2}$ lbs.; Oat short, white and plump; length of panicle, 9 to 12 inches; branching; length of straw, 48 to 50 inches; very slender; considerably lodged; stem considerably rusted.

Banner.—On light sandy soil; previous crop was oats; manured in autumn of 1891; ploughed autumn of 1891; in spring of 1892 disc harrowed twice, and with smoothing harrow once; 8 acres; sown April 30th; 2 bushels per acre; ripe, August 13th; time to mature, 105 days; yield per acre, 26 bushels and 13 lbs.; weight per bushel, $37\frac{1}{4}$ lbs.; oat long and white; length of panicle, 9 to 11 inches; branching; length of straw, 30 to 36 inches; standing well; very little rust. Water stood too long on a large part of plot and scalded it, which very much lessened the yield of this variety.

Black Brie.—On sandy loam; previous crop was barley; manured in autumn of 1891; ploughed in autumn of 1891; was disc harrowed in spring of 1892 twice, and once with smoothing harrow; $\frac{1}{10}$ acre; sown April 30th; $2\frac{1}{4}$ bushels per acre; ripe, August 15th; time to mature, 107 days; yield per acre, 34 bushels and 28 lbs.; weight per bushel, 33 lbs.; oat medium to long, slender, tawny to black, length of panicle, 7 to 9 inches; branching; length of straw, 38 to 44 inches; slender straw; standing fairly well; stem considerably rusted.

Cream Egyptian.—On sandy loam; previous crop was pease; this was the first crop since breaking, has never had manure; ploughed in spring of 1892, harrowed with smoothing harrow three times; $1\frac{3}{4}$ acres; sown April 20th, $1\frac{3}{4}$ bushels per acre; ripe August 2nd; time to mature, 104 days; yield per acre, 36 bushels 18 lbs.; weight per bushel, $38\frac{1}{2}$ lbs.; oat medium length, fairly plump, white; length of panicle, 8 to 10 inches, sided; length of straw, 44 to 48 inches; strong and fairly coarse; considerably lodged; stem very badly rusted.

Cave.—On sandy loam; previous crop was corn; manured in spring of 1890; ploughed in spring of 1892 and harrowed twice; 1 acre; sown April 21st; $1\frac{1}{2}$ bushels per acre, ripe August 5th; time to mature, 106 days; yield per acre, 45 bushels 16 lbs.; weight per bushel, $40\frac{1}{4}$ lbs.; oat medium length, white and plump; length of panicle, 7 to 9 inches; loosely sided; length of straw 40 to 43 inches; considerably lodged on low land and standing fairly well on high land; not much rust on high land and almost ruined by it on low land.

Challenge White Canadian.—On light sandy soil; previous crop was Banner oats, manured in spring 1892; ploughed in spring 1892; harrowed with smoothing harrow twice; $\frac{3}{4}$ acre; sown April 29th; $1\frac{3}{4}$ bushels per acre; ripe August 1st; time to mature, 94 days; yield per acre, 39 bushels 31 lbs.; weight per bushel, 42 lbs.; oat short, plump and white; length of panicle, 7 to 9 inches; branching; length of straw 38 to 40 inches; straw very slender and weak; considerably broken down about one foot from ground; stem considerably rusted.

Californian Prolific Black.—On sandy loam; previous crop was barley; manured in autumn of 1891; ploughed in autumn of 1891; it was disc harrowed twice in spring of 1892 and once with smoothing harrow; $\frac{1}{2}$ acre: sown April 29th; 2 bushels per acre; ripe August 14th and 15th; time to mature, 107 and 108 days; yield per acre, 34 bushels 1 lb.; weight per bushel, $37\frac{1}{2}$ lbs.; oat medium length, slender, tawny; length of panicles 7 to 10 inches; sided; length of straw, 38 to 42 inches; straw coarse, standing fairly well; stem badly rusted.

Coulommiers.—On sandy loam; previous crop was barley; manured in autumn of 1891; ploughed in autumn of 1891, and disc harrowed twice, and once with smoothing harrow in spring of 1892; $\frac{1}{3}$ acre; sown April 30th; $2\frac{1}{4}$ bushels per acre; ripe Aug. 16th; time to mature, 108 days; yield per acre, 35 bushels 33 lbs.; weight per bushel, $30\frac{3}{4}$ lbs.; oat short, plump and black; length of panicle, 7 to 9 inches branching; length of straw 33 to 36 inches, very slender; standing well; stem badly rusted. Was injured by water.

Early Archangel.—On light sandy soil; previous crop was Banner oats; manured in spring of 1892; ploughed in spring of 1892, and harrowed with smoothing harrow twice; $\frac{1}{2}$ acre; sown April 29th; $1\frac{1}{2}$ bushels per acre; ripe Aug. 4th; time to mature, 97 days; yield per acre, 32 bushels 1 lb.; weight per bushel, 42 lbs.; oat

medium length, plump, white; length of panicle 6 to 7 inches branching; length of straw 40 to 45 inches, rather slender; standing fairly well; stem considerably rusted.

Early Etampes.—On sandy loam; previous crop was barley; manured in autumn of 1891; ploughed in autumn of 1891; it was disc harrowed in spring of 1892, twice, and with smoothing harrow once; $\frac{1}{3}$ acre; sown April 30th; $2\frac{1}{2}$ bushels per acre; ripe Aug. 8th; time to mature 100 days; yield per acre 14 bushels 13 lbs.; weight per bushel $35\frac{3}{4}$ lbs.; oat medium to long, not very plump, black; length of panicle 8 to 10 inches; branching: length of straw 38 to 40 inches; straw slender; standing fairly well; stem considerably rusted. Very much injured by water.

Early Gothland.—On sandy loam; previous crop was part corn and part barley; manured in autumn of 1891; ploughed in autumn of 1891; it was disc harrowed twice in spring of 1892, and with smoothing harrow once; $\frac{1}{10}$ acre; sown April 30th; $1\frac{1}{2}$ bushels per acre; ripe Aug. 8th; time to mature, 100 days; yield per acre 34 bushels 18 lbs.; weight per bushel, $31\frac{3}{4}$ lbs.; oat short to medium, white; length of panicle, 6 to 9 inches; length of straw, 36 to 38 inches; straw moderately slender; considerably lodged, stem badly rusted.

English Potato.—On sandy loam; previous crop was oats; manured in spring of 1892; ploughed in spring of 1892; harrowed with smoothing harrow three times; 4 acres; sown May 13th; $1\frac{3}{4}$ bushels per acre; ripe Aug. 12th; time to mature, 91 days; yield per acre, 24 bushels 7 lbs.; weight per bushel, 32 lbs.; oat short and white; length of panicle, 7 to 10 inches, sided; length of straw, 36 to 44 inches, very badly lodged; stem considerably rusted.

Flying Scotchman.—On sandy loam; previous crop was corn; manured in spring of 1890; ploughed in spring of 1892, and harrowed twice; 1 acre; sown 21st April, $1\frac{1}{2}$ bushels per acre; ripe 31st July; time to mature, 101 days; yield per acre, 53 bushels, 29 lbs.; weight per bushel, 42 lbs.; oat short to medium, plump, white; length of panicle, 11 to 12 inches; branching; length of straw, 50 to 52 inches, straw very slender; considerably lodged; stem considerably rusted.

Giant Cluster.—On sandy loam; previous crop was Kinver Chevalier barley; manured in spring of 1890; ploughed in autumn of 1891, gang plowed in spring of 1892 and harrowed with smoothing harrow; 5 acres; sown 22nd April, $1\frac{3}{4}$ bushels per acre; ripe 8th August; time to mature, 108 days; yield per acre, 43 bushels 21 lbs; weight per bushel, $31\frac{1}{4}$ lbs.; oat long, rather slender, deep yellow; length of panicle, 9 to 12 inches; sided; length of straw, 45 to 50 inches, straw coarse; standing well; much injured by rust.

Giant Swedish.—On light sandy soil; previous crop was Banner oats; manured in spring of 1892; ploughed in spring of 1892 and harrowed with smoothing harrow twice; 1 acre; sown 29th April; $1\frac{1}{2}$ bushels per acre; ripe 15th August; time to mature, 108 days; yield per acre, 32 bushels 5 lbs.; weight per bushel, $31\frac{1}{2}$ lbs.; oat long, and yellow; length of panicle, 7 to 10 inches, sided; length of straw, 34 to 40 inches; straw medium as to coarseness; all standing well; stem slightly rusted.

Golden Beauty.—On sandy loam; previous crop part corn and part barley; manured in the autumn of 1891; ploughed in the autumn of 1891; it was disc harrowed twice in the spring of 1892 and with smoothing harrow once; $\frac{1}{2}$ acre; sown 30th April; $1\frac{3}{4}$ bushels per acre; ripe 5th August; time to mature, 97 days; yield per acre, 43 bushels 13 lbs.; weight per bushel, $33\frac{1}{2}$ lbs.; oat medium to long, pale yellow; length of panicle 7 to 9 inches; branching; length of straw 40 to 45 inches; straw not too coarse; all standing fairly well; stem very badly rusted.

Holstein Prolific.—On heavy sandy loam mixed with clay; previous crop experimental plots of grain; manured in spring of 1891; ploughed in autumn of 1891. It was disc harrowed once in spring of 1892 and twice with smoothing harrow; 4 acres; sown 22nd April; 2 bushels per acre; ripe 2nd August; time to mature, 102 days; yield per acre, 30 bushels 14 lbs.; weight per bushel, 33 lbs.; oat long, pale yellow; length of panicle, 7 to 9 inches; branching; length of straw, 40 to 48 inches; straw rather slender; considerably lodged and broken by wind and rain storms; stem considerably rusted.

Hazlett's Seizure.—On light sandy soil; previous crop was Banner oats; manured in spring of 1892; ploughed in spring of 1892 and harrowed with smoothing harrow twice; $\frac{2}{3}$ acre; sown 29th April; $1\frac{1}{2}$ bushels per acre; ripe 4th August; time to mature, 96 days; yield per acre, 29 bushels 30 lbs.; weight per bushel, $43\frac{3}{4}$ lbs.; oat short, plump and white; length of panicle, 9 to 11 inches; branching; length of straw, 38 to 43 inches; straw moderately coarse; standing fairly well; stem considerably rusted.

Houdan.—On clay loam; previous crop was flax; no manure; ploughed in spring of 1892, harrowed three times with smoothing harrow; $1\frac{1}{3}$ acres; sown 13th May; 2 bushels per acre; ripe 13th August; time to mature, 92 days; yield per acre, 38 bushels 8 lbs.; weight per bushel, 33 lbs.; oat medium length, tawny to black; length of panicle, 7 to 9 inches; branching; length of straw, 30 to 36 inches; straw rather too slender; standing well; stem considerably rusted.

Improved Ligowo.—On sandy loam; previous crop was six-rowed barley; manured in spring of 1890; ploughed in autumn of 1891, gang ploughed in spring of 1892 and harrowed with smoothing harrow; $1\frac{1}{5}$ acres; sown 22nd April; $1\frac{3}{4}$ bushels per acre; ripe 7th August; time to mature, 107 days; yield per acre, 34 bushels 26 lbs.; weight per bushel, 36 lbs.; oat medium to long, white; length of panicle, 7 to 10 inches; branching; length of straw 40 to 44 inches; straw medium; stem considerably rusted.

Joanette.—On sandy loam; previous crop was barley; manured in autumn of 1891; ploughed in autumn of 1891, disc harrowed twice and once with smoothing harrow in spring of 1892; $1\frac{1}{3}$ acres; sown 29th April; 2 bushels per acre; ripe 13th August; time to mature, 106 days; yield per acre, 45 bushels 20 lbs.; weight per bushel, 35 lbs.; oat medium to long, tawny to black; length of panicle, 7 to 9 inches; branching; length of straw, 30 to 36 inches; straw slender and weak; not badly lodged; stem considerably rusted.

Oderbruch.—On clay loam; previous crop was oats; manured in spring of 1892; plowed in spring of 1892, harrowed with smoothing harrow three times; $13\frac{1}{3}$ acres; $1\frac{3}{4}$ bushels per acre; sown May 13th; ripe August 16th; time to mature, 95 days; yield per acre, 45 bushels 20 lbs.; weight per bushel, $33\frac{1}{2}$ lbs.; oat medium length, white; length of panicle, 7 to 11 inches; sided; length of straw, 36 to 44 inches; standing fairly well; stem considerably rusted.

Prize Cluster.—On clay loam, part peat; previous crop was oats; manured in spring of 1892; ploughed in spring of 1892, harrowed with smoothing harrow three times; $8\frac{1}{4}$ acres; sown May 10th; $1\frac{1}{2}$ bushels per acre; ripe August 13th; time to mature, 95 days; yield per acre, 22 bushels 28 lbs. (Note—apparently nearly one-half lay shelled on the ground after a heavy storm) weight per bushel, $35\frac{3}{4}$ lbs.; oat short, white; length of panicle, 7 to 10 inches; branching; length of straw, 36 to 40 inches; straw rather too weak; badly broken and lodged; stem very badly rusted.

Royal Doncaster Prize.—On clay loam; previous crop was experimental plots of grain; manured in autumn of 1891; it was disc harrowed once in spring of 1892, and harrowed twice with smoothing harrow; $2\frac{1}{3}$ acres; sown, 22nd April; $1\frac{1}{2}$ bushels per acre; ripe, 4th August; time to mature, 104 days; yield per acre, 22 bushels 1 lb.; weight per bushel, $33\frac{1}{4}$ lbs.; oat short, white; length of panicle, 8 to 9 inches; branching; length of straw, 40 to 44 inches; straw rather slender; standing fairly well, a few spots lodged; stem very badly rusted.

Rennie's Prize White.—On light sandy soil; previous crop was Banner oats; manured in spring of 1892; ploughed in spring of 1892, and harrowed three times with smoothing harrow; 1 acre; sown 9th May; $1\frac{1}{2}$ bushels per acre; ripe, 8th August; time to mature, 91 days; yield per acre, 45 bushels 1 lb.; weight per bushel, $38\frac{1}{2}$ lbs; oat short, white much like Prize Cluster; length of panicle, 7 to 9 inches; branching; length of straw, 36 to 42 inches; straw weak, badly broken down and lodged; stem, badly rusted.

Rosedale.—On sandy loam; previous crop was pease; manured in spring of 1892; ploughed in spring of 1892, and harrowed with smoothing harrow twice; $3\frac{1}{4}$ acres; sown 27th April; $1\frac{1}{2}$ bushels per acre, ripe 10th August; time to mature, 105 days; yield per acre, 36 bushels 14 lbs.; weight per bushel, $37\frac{1}{4}$ lbs.; oat short to

medium, white; length of panicle, 8 to 10 in.; sided to slightly branching; length of straw, 38 to 44 in.; straw coarser than Prize Cluster; badly lodged; stem considerably rusted.

Scottish Chief.—On sandy loam; previous crop was part corn and part barley; manured in autumn of 1891; ploughed in autumn of 1891, in spring of 1892 it was disc harrowed twice and with smoothing harrow once; $\frac{1}{10}$ acre; sown 30th April; $1\frac{1}{2}$ bushels per acre, ripe 4th August; time to mature, 96 days; yield per acre, 47 bushels 8 lbs.; weight per bushel, 41 lbs.; oat short to medium, white; length of panicle, 9 to 11 in.; branching; length of straw, 40 to 45 in.; straw rather coarse but rather weak; very badly broken about one foot from ground; stem badly rusted.

Black Tartarian.—On sandy loam; previous crop was part corn and part barley; barley land only manured in autumn of 1891; ploughed in autumn of 1891, in spring of 1892 it was disc harrowed twice and with smoothing harrow once; $1\frac{1}{6}$ acre; sown 30th April; 2 bushels per acre, ripe 13th August; time to mature, 105 days; yield per acre, 36 bushels; weight per bushel, 33 lbs.; oat long, tawny to black; length of panicle, 7 to 11 in.; sided; length of straw, 38 to 40 in.; standing fairly well; stem badly rusted.

EXPERIMENTS WITH BARLEY.

During the past season fifty-eight varieties of barley have been grown on the Central Experimental Farm of which thirty-six were two-rowed sorts and twenty-two six-rowed. Fourteen of these varieties have been grown in field plots nine of two-rowed and five of six-rowed, particulars of the results will be found appended; the remaining varieties have all been grown in smaller plots. Of the two-rowed sorts thirteen of the most promising were sown side by side on the same day in plots of one-twentieth of an acre for the purpose of determining their relative earliness and productiveness, ten varieties of six-rowed barley were subject to a similar test. These plots were alongside of the one-twentieth acre plots of oats. For particulars as to treatment of the land see experiments with oats. Owing to the unfavourable season the barley crops are below the average of previous years both in quantity and quality.

Two-rowed Barley.

Test of Varieties, all sown same day.

Variety.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Yield per Acre.		Weight per Bushel.
				Bush.	Lbs.	Lbs.
Swedish	April 26	Aug. 3	99	45	00	$52\frac{1}{4}$
Duck-bill	do 26	do 4	100	40	20	$51\frac{1}{4}$
Phœnix von Thalen	do 26	do 1	97	40	00	$51\frac{1}{2}$
Danish Chevalier	do 26	do 8	104	35	00	$51\frac{1}{4}$
Kinver Chevalier	do 26	do 7	103	34	08	$51\frac{1}{4}$
French Chevalier	do 26	do 8	104	33	16	$50\frac{1}{4}$
Italian	do 26	do 5	101	32	24	$48\frac{3}{4}$
New Golden Grains	do 26	do 7	103	32	08	$49\frac{3}{4}$
Canadian Thorpe	do 26	do 5	101	31	12	$50\frac{3}{4}$
Odessa Two-rowed	do 26	July 30	95	30	00	$50\frac{3}{4}$
Saale	do 26	Aug. 7	103	28	16	$49\frac{3}{4}$
Prize Prolific	do 26	do 7	103	27	24	$49\frac{1}{2}$
Goldthorpe	do 26	do 14	110	27	04	50

Larger Field Plots of Two-rowed Barley.

Canadian Thorpe.—On sandy loam; previous crop was Prize Cluster oats; manured in spring of 1889; ploughed in autumn of 1891; disc harrowed twice in spring of 1892, and once with smoothing harrow; 1¾ acres; sown, April 27th; 1¾ bushels per acre; ripe, August 1st; time to mature, 96 days; yield per acre, 27 bushels and 3 lbs.; weight per bushel, 48¾ lbs.; length of head, 2½ to 3½ inches, length of straw, 38 to 42 inches. All standing well; no rust.

Duck-bill.—On sandy loam; previous crop was turnips; manured in spring of 1891; ploughed in autumn of 1891, and was disc harrowed twice in spring of 1892, and once with smoothing harrow; 1 acre; sown April 22nd; 1½ bushels per acre; ripe, July 31st; time to mature, 100 days; yield per acre cannot be estimated on account of large quantity of barley in straw being taken for exhibition purposes; weight per bushel, 47½ lbs.; length of head, 3 inches; length of straw, 47 to 49 inches; strong straw; standing very well, only a small spot lodged; stem slightly rusted.

Danish Chevalier—On sandy loam; previous crop was Prize Cluster oats; manured in spring of 1889; ploughed in autumn of 1891; disc harrowed twice and with smoothing harrow once in spring of 1892; 1⅙ acres; sown, April 27th; 1¾ bushels per acre; ripe, August 3rd and 4th; time to mature, 98 to 99 days; yield per acre, 24 bushels and 47 lbs.; weight per bushel, 48¼ lbs.; length of head, 4 to 4½ inches; length of straw, 35 to 38 inches; stem very slightly rusted.

Goldthorpe.—On clay loam; previous crop was wheat; manured in spring of 1892; ploughed in spring of 1892, and harrowed with smoothing harrow three times; 2⅓ acres; sown May 9th; 1½ bushels per acre; ripe, August 15th; time to mature, 98 days; yield per acre, 24 bushels and 26 lbs.; weight per bushel, 48¾ lbs.; length of head, 3 to 3½ inches; length of straw, 38 to 40 inches; all standing well; stem considerably rusted.

Kinver Chevalier.—On sandy loam; previous crop was Prize Cluster oats; manured in spring of 1889; ploughed in autumn of 1891; disc harrowed twice and with smoothing harrow once in spring of 1892; 2¾ acres; sown April 27th; 1¾ bushels per acre; ripe, August 3rd; time to mature, 98 days; yield per acre, 30 bushels and 11 lbs.; weight per bushel, 50 lbs; length of head, 4 to 4½ inches; length of straw, 35 to 38 inches; straw rather slender and weak, but not badly lodged; stem very slightly rusted.

Large Two-rowed Naked.—On sandy loam; previous crop was Prize Cluster oats; manured in spring of 1891; ploughed in autumn of 1891; disc harrowed twice and with smoothing harrow once in spring of 1892; ⅓ acre; sown April 27th; 2½ bushels per acre; ripe July 25th; time to mature 89 days; yield per acre, 26 bushels, 20 lbs.; weight per bushel, 60¾ lbs.; length of head, 2½ to 3 inches; length of straw, 28 to 34 inches; straw very weak; badly lodged; no rust.

Odessa two-rowed.—On sandy loam; previous crop was Prize Cluster oats; manured in spring of 1891; ploughed in autumn of 1891, disc harrowed twice and once with smoothing harrow in spring of 1892; ¼ acre; sown April 27th; 1½ bushels per acre; ripe July 27th; time to mature, 91 days; yield per acre, 31 bushels, 5 lbs.; weight per bushel, 48½ lbs.; length of head, 3¼ to 3½ inches; length of straw, 38 to 43 inches; straw very weak and badly lodged; stem slightly rusted.

Prize Prolific.—On sandy loam; previous crop was Prize Cluster oats; manured in spring of 1889; ploughed in autumn of 1891; disc harrowed twice and once with smoothing harrow in spring of 1892; 2 acres; sown April 27th; 1¾ bushels per acre; ripe August 2nd; time to mature, 97 days; yield per acre, 27 bushels 35 lbs.; weight per bushel, 49½ lbs.; length of head, 4 to 4½ inches; length of straw, 35 to 38 inches; considerably lodged; stem very slightly rusted.

Saale.—On sandy loam; previous crop was Prize Cluster oats; manured in spring of 1891; ploughed in autumn of 1891; disc harrowed twice and once with smoothing harrow in spring of 1892; 1 acre; sown April 27th; 1¾ bushels per acre; ripe August 2nd; time to mature, 97 days; yield per acre, 31 bushels, 32 lbs,; weight per bushel, 47½ lbs.; length of head, 4 to 4½ inches; length of straw, 35 to 38 inches; considerably lodged; stem very slightly rusted.

SIX-ROWED BARLEY.

Test of Varieties, all sown same day.

Variety.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Yield per Acre.	Weight per Bushel.
				Bush. Lbs.	Lbs.
Common	April 26	July 28	93	36 32	$49\frac{1}{2}$
Mensury	do 26	do 31	96	36 32	$48\frac{3}{4}$
Odessa Six-rowed	do 26	do 30	95	29 8	50
Petschora	do 26	do 28	93	29 8	47
Norway House, from	do 26	do 28	93	28 16	$47\frac{1}{4}$
Rennie's Improved	do 26	do 31	96	27 24	$48\frac{1}{2}$
Oderbruch	do 26	do 28	93	27 4	$49\frac{1}{4}$
Baxter's Six-rowed	do 26	do 31	96	24 8	$46\frac{3}{4}$
Guaymalaye (Hulless)	do 26	Aug. 1	97	20 00	$57\frac{1}{2}$
Sialkot	do 26	July 26	91	19 8	$44\frac{3}{4}$

Baxter's Six-rowed.—On clay loam and peat; previous crop was oats; manured in spring of 1892; ploughed in spring of 1892, and harrowed three times with smoothing harrow, $1\frac{1}{4}$ acre; sown May 9th; $1\frac{1}{2}$ bushels per acre; ripe Aug. 1st; time to mature, 84 days; yield per acre, 30 bushels 33 lbs.; weight per bushel, 50 lbs.; length of head, $2\frac{1}{2}$ to $2\frac{3}{4}$ inches; length of straw, 40 to 42 inches, standing very well, only one spot lodged; stem very slightly rusted.

Guaymalaye (Hulless).—On sandy loam; previous crop was Prize Cluster oats; manured in spring of 1891; ploughed in autumn of 1891, in spring of 1892 it was disc harrowed twice and once with smoothing harrow; $\frac{1}{3}$ acre; sown April 27th; $1\frac{3}{4}$ bushels per acre; ripe July 26th; time to mature, 90 days; yield per acre, 26 bushels 9 lbs.; weight per bushel, $59\frac{3}{4}$ lbs.; length of head, $2\frac{1}{2}$ to 3 inches; length of straw, 40 to 44 inches; very badly lodged; stem considerably rusted.

Odessa Six-rowed.—On light sandy soil; a crop of peas was ploughed in when in flower for manure in summer of 1891; ploughed again in spring of 1892, and harrowed with smoothing harrow twice; $\frac{1}{2}$ acre; sown May 3rd; $1\frac{3}{4}$ bushels per acre; ripe July 27th; time to mature, 85 days; yield per acre, 44 bushels 3 lbs.; weight per bushel, $47\frac{1}{2}$ lbs.; length of head, $2\frac{1}{2}$ to 3 inches; length of straw, 33 to 36 inches, standing well; no rust.

Oderbruch.—On light sandy soil; a crop of pease was ploughed in when in flower for manure in summer of 1891; ploughed again in spring of 1892, and harrowed with smoothing harrow twice; $\frac{2}{3}$ acres; sown May 3rd; $1\frac{3}{4}$ bushels per acre; ripe, July 25th; time to mature, 85 days; yield per acre, 47 bushels 25 lbs.; weight per bushel, $49\frac{1}{2}$ lbs.; length of head, $2\frac{1}{2}$ to $2\frac{3}{4}$ inches; length of straw, 30 to 39 inches standing fairly well; no rust.

Rennie's Improved Six-rowed.—On light sandy soil; a crop of pease was ploughed in when in flower for manure in summer of 1891; ploughed in spring of 1892, and harrowed with smoothing harrow twice; 1 acre; sown May 3rd, $1\frac{3}{4}$ bushels per acre; ripe, July 26th and 27th; time to mature, 84 to 85 days; yield per acre, 38 bushels 24 lbs.; weight per bushel, 48 lbs.; length of head, $2\frac{1}{2}$ to $2\frac{3}{4}$ inches; length of straw, 40 to 44 inches standing fairly well: no rust.

EXPERIMENTS WITH WHEAT.

During the season of 1892, 46 varieties of spring wheat have been tested, 8 of which have been grown in field plots, the remainder in smaller plots. Of these latter, 19 sorts have been tested as to their relative earliness and productiveness, by sowing them all on the same day side by side, on a fairly uniform piece of land, a dark sandy loam which received a dressing of Royal Canadian fertilizer, 400 lbs. per acre in the spring of 1892. The land was ploughed late in the autumn of 1891,

disc harrowed twice and once with smoothing harrow in the spring of 1892. The results are given in the appended table.

Test of Varieties of Spring Wheat, all sown same day.

Variety.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Yield per Acre.		Weight per Bushel.
				Bush.	Lbs.	Lbs.
Pringle's Champlain	April 23	Aug. 7	106	29	00	61
Hueston's	do 23	do 9	108	28	40	58¼
Wellman's Fife	do 23	do 14	113	28	32	59
White Russian	do 23	do 14	113	27	19	58
Rio Grande	do 23	do 14	113	27	00	60¾
Judket	do 23	do 14	113	24	40	58½
Great Western	do 23	do 14	113	24	00	60¾
White Fife	do 23	do 14	113	23	36	58¾
White Chaff, Campbell's,	do 23	do 6	105	23	20	56¾
Red Fern	do 23	do 9	108	23	20	60½
White Connell	do 23	do 9	108	21	50	57½
Ladoga	do 23	do 3	102	21	40	58¼
Black Sea	do 23	do 1	100	21	40	57¾
Triumph, Campbell's	do 23	do 6	105	21	20	60
Johnston's Defiance	do 23	do 9	108	20	00	57½
Lahoul	do 23	July 31	99	19	5	54
Red Fife	do 23	Aug. 14	113	19	00	58
Anglo Canadian	do 23	do 9	108	17	20	54
Hard Calcutta	do 23	July 31	99	15	00	61¼

Campbell's White Chaff.—On sandy loam; previous crop was Prize Prolific barley; has had no manure since farm was purchased; ploughed in autumn of 1891, disc harrowed once and twice with smoothing harrow in spring of 1892; 3⅗ acres; sown 29th April; 1½ bushels per acre; ripe, 9th August; time to mature, 102 days; yield per acre, 15 bushels; weight per bushel, 54¼ lbs; length of head 3 to 3½ inches; beardless; length of straw, 45 to 48 inches; stem very badly rusted; considerably broken down about 1 foot from ground.

Colorado.—On sandy loam and peaty soil; previous crop was two-rowed barley; manured in spring of 1890; ploughed in autumn of 1891; disc harrowed twice in spring of 1892 and with smoothing harrow once; ¾ acre; sown 2nd May; 1½ bushels per acre; ripe, 9th August; time to mature, 99 days; yield per acre, 13 bushels, 37 lbs. (note—yield lessened considerably by loss from shelling); weight per bushel, 54¾ lbs; length of head, 2½ to 3½ inches; bearded; length of straw, 36 to 40 inches; straw slender; standing fairly well; very little rust.

Lahoul.—On sandy soil; previous crop was turnips; manured in spring of 1888, and had a coat of ashes in spring of 1891; ploughed in autumn of 1891; disc harrowed once and with smoothing harrow twice in spring of 1892; ¼ acre; sown, 21st April; 1½ bushels per acre; ripe, 3rd August; time to mature, 104 days; yield per acre, 10 bushels, 38 lbs; weight per bushel, 54 lbs; length of head, 3 inches; bearded; length of straw, 30 to 36 inches; straw rather slender; all standing well; stem considerably rusted.

Rio Grande.—On sandy loam and peaty soil; previous crop was Prize Prolific barley; has had no manure; ploughed in autumn of 1891; it was disc harrowed once in spring of 1892 and twice with smoothing harrow; 4 acres; sown, 29th April; 1½ bushels per acre; ripe, 13th August; time to mature, 106 days; yield per acre, 18 bushels, 27 lbs; weight per bushel, 58½ lbs; length of head, 3½ to 4 inches; bearded; length of straw, 45 to 50 inches; standing well; straw, very bright and strong.

Red Fife.—On sandy loam; previous crop was two-rowed barley; manured in spring of 1890; ploughed in autumn of 1891; it was disc harrowed twice in spring of 1892 and once with smoothing harrow; ¾ acre; sown 30th April; 1½ bushels per acre; ripe 13th August; time to mature, 105 days; yield per acre, 23 bushels, 31

lbs.; weight per bushel, 58¼ lbs.; length of head, 3½ to 3¾ in.; beardless; length of straw, 38 to 44 in.; stem slightly rusted.

White Fife.—On sandy loam; previous crop was two-rowed barley; manured in spring of 1890; ploughed in autumn of 1891; it was disc harrowed twice in spring of 1892 and once with smoothing harrow; ¾ acre; sown 30th April; 1½ bushels per acre; ripe 13th August; time to mature, 105 days; yield per acre, 22 bushels, 38 lbs.; weight per bushel, 59¼ lbs.; length of head, 3½ to 4 in.; beardless; length of straw, 38 to 44 in.; stem slightly rusted.

White Connell.—On sandy loam; previous crop was two-rowed barley; manured in spring of 1890; ploughed in autumn of 1891; it was disc harrowed twice in spring of 1892 and once with smoothing harrow; 1 acre; sown 2nd May; 1½ bushels per acre; ripe 15th August; time to mature 105 days: yield per acre, 15 bushels 51 lbs; weight per bushel, 58 lbs.; length of head 3½ to 4 inches; beardless; length of straw, 40 to 46 inches; straw very stiff and standing well; stem slightly rusted.

White Russian.—On sandy loam; previous crop was two-rowed barley; manured in spring of 1890; ploughed in autumn of 1891, it was disc harrowed twice in the spring of 1892 and once with smoothing harrow; 1 acre; sown 2nd May; 1½ bushels per acre; ripe 13th August; time to mature, 103 days; yield per acre, 14 bushels 3 lbs.; weight per bushel, 56½ lbs.; length of head, 3 to 3¼ inches; beardless; length of straw, 30 to 35 inches; standing well; stem slightly rusted.

EXPERIMENTS WITH PEASE.

Eleven varieties of pease were sown in field plots with the following results:—

Black-eyed Marrowfat.—On sandy soil; previous crop was oats; manured in spring of 1892; ploughed in spring of 1892 and harrowed twice with smoothing harrow; 1 acre; sown 23rd April; 3¾ bushels per acre; ripe August 10th; time to mature, 109 days; yield per acre, 19 bushels 48 lbs.; weight per bushel, 60½ lbs.; vines made a very strong growth.

Crown.—On sandy loam and peaty soil; previous crop was corn; manured in spring of 1890; ploughed in autumn of 1891; disc harrowed twice in spring of 1892 and once with smoothing harrow; 1 acre; sown 2nd May; 2½ bushels per acre; ripe 7th August; time to mature, 97 days; yield per acre, 24 bushels 40 lbs.; weight per bushel 63¼ lbs.; length of vines, 38 to 40 inches; vines made very strong growth.

Centennial.—On sandy loam and peaty soil; previous crop was corn; manured in spring of 1890; ploughed in autumn of 1891; disc harrowed twice in spring of 1892 and once with smoothing harrow; 1 acre; sown 2nd May; 2¾ bushels per acre; ripe August 12th; time to mature, 102 days; yield per acre, 21 bushels 23 lbs.; weight per bushel, 62½ lbs.; length of vine, 45 to 50 inches; vines made very strong growth.

Daniel O'Rourke.—On sandy loam; previous crop was turnips; had a coat of ashes in spring of 1892; ploughed in autumn of 1891; disc harrowed twice in spring of 1892 and twice with smoothing harrow; ⅙ acre; sown 10th May; 2½ bushels per acre; time of ripening not noted; yield per acre, 20 bushels 12 lbs.; weight per bushel, 62 lbs.

Golden Vine.—On sandy loam and peaty soil; previous crop was corn; manured in spring of 1890; ploughed in autumn of 1891; disc harrowed twice in spring of 1892 and once with smoothing harrow; ¾ acre; sown 2nd May; 2½ bushels per acre; ripe 11th August; time to mature, 101 days; yield per acre, 22 bushels, 15 lbs.; weight per bushel, 65½ lbs.; length of vine, 40 to 46 inches; vines made very strong growth.

Large White Marrowfat.—On sandy soil; previous crop was oats; manured in spring of 1892; ploughed in spring of 1892 and harrowed twice with smoothing harrow; 1¼ acres; sown 23rd April; 3¾ bushels per acre; ripe 10th August; time to mature, 109 days; yield per acre, 16 bushels 25 lbs.; weight per bushel 61 lbs.; vines made very strong growth.

Mummy.—On sandy loam; previous crop was spring rye; manured in spring of 1888; ploughed in spring of 1892 and harrowed with smoothing harrow twice; 3 acres; sown 28th April; 3 bushels per acre; ripe 7th and 8th August; time to

mature, 101 to 102 days; yield per acre, 25 bushels, 8 lbs.; weight per bushel, 61¾ lbs.; length of vine 45 to 50 inches; vines made very strong growth.

Multiplier.—On sandy loam and peaty soil; previous crop was corn; manured in spring of 1890; ploughed in autumn of 1891; disc harrowed twice in spring of 1892 and once with smoothing harrow; 1 acre; sown 2nd May; 2½ bushels per acre; ripe 11th August; time to mature 101 days; yield per acre, 19 bushels 47 lbs.; weight per bushel, 63½ lbs.; length of vine, 40 to 46 inches; vines made very strong growth.

Prince Albert.—On sandy soil; previous crop was oats; manured in spring of 1892, and ploughed and harrowed twice with smoothing harrow; 1 acre; sown 23rd April; 2½ bushels per acre; ripe, 9th August; time to mature, 108 days; yield per acre, 15 bushels and 43 lbs.; weight per bushel, 61 lbs.

Pride.—On sandy loam and peaty soil; previous crop was corn; manured in spring of 1890; ploughed in autumn of 1891; disc harrowed twice in spring of 1892, and once with smoothing harrow; 1⅓ acres; sown, 2nd May; 3¼ bushels per acre; ripe, 8th August; time to mature, 98 days; yield per acre, 16 bushels and 50 pounds; weight per bushel, 58 lbs; length of vine, 32 to 37 inches; vines made very strong growth.

EXPERIMENTS WITH TURNIPS.

Seventeen varieties of turnips were tested in plots, and the yield per acre in each case has been calculated from the weight of roots gathered from three rows, 2½ feet apart and 66 feet long. The first set of these plots was sown 13th May, the second 10th June, and harvested 17th October.

This crop suffered again from a peculiar form of rot attacking the root which has prevailed in the Ottawa district during the past two years. The injury from this disease in 1892 has been less than in 1891. No satisfactory explanation has yet been given as to the cause of this trouble, nor has any remedy been discovered to prevent it. The first series of plots was so much injured as to be practically worthless for the purpose of comparison. The second set of plots gave a partial crop, the particulars of which are given in the appended table:—

SECOND SERIES of Plots, sown 10th June.

Variety.	Yield per Acre.		Yield per Acre.	
	Tons.	Lbs.	Bush.	Lbs.
Novelty Swede No. 1	14	1,920	498	40
Novelty Swede No. 2	13	1,984	466	24
Prize Purple Top (Rennie)	13	1,456	457	36
Hartley's Bronze	13	48	434	8
Mammoth Purple Top	12	992	416	32
Marquis of Lorne	12	288	404	48
Bronze Top Extra	12	288	404	48
Purple Top (Steele)	10	1,824	363	44
Jumbo or Monarch Swede	10	1,472	357	52
Carter's Elephant Purple Top	10	1,296	354	56
Prize Purple Top (Pearce)	9	1,008	316	48
Sutton's Champion	9	128	302	8
Greystone	7	1,840	264	0
Skirvings Improved Purple Top	6	1,392	223	12
Bangholm Purple Top Swede	6	1,024	217	4
Elephant or Giant King	5	560	176	0

One field plot of Skirvings Swede of about 1¾ acres gave a yield of 16 tons 1,448 lbs. per acre, equal to 557 bush. 28 lbs. These did not suffer so severely from rot as those in the smaller plots.

EXPERIMENTS WITH MANGELS.

Thirteen varieties of mangels have been grown in plots, side by side and the crop per acre calculated from the yield obtained from three rows $2\frac{1}{2}$ feet apart and 66 feet long. Two sets of these plots were sown, the first, 10th May, the second, 21st May. Those earlier sown were harvested 14th October, those later 17th October, with results given below. The soil was sandy loam, has had no manure, but received a coating of unleached ashes in the autumn of 1891, about 150 bushels per acre. It was ploughed in the autumn of 1891, disc harrowed twice in the spring of 1892, and twice with the smoothing harrow.

First Series of Plots, sown 10th May.

Variety.	Yield per Acre.		Yield per Acre.	
	Tons.	Lbs.	Bush.	Lbs.
Yellow Globe	26	1,152	885	52
Giant Yellow Intermediate	24	752	812	32
Berkshire Prize	24	224	803	44
Canadian Giant	23	640	777	20
Mammoth Long Red (Bruce)	23	464	774	24
Mammoth Long Red (Steele)	21	768	712	48
Selected Mammoth Long Red	20	1,008	683	28
Mammoth Long Red (Simmers)	20	480	674	40
Warden Globe	20	480	674	40
Red Fleshed Tankard	19	896	648	16
Red Globe Oberndorff	19	368	639	28
Red Globe	18	1,488	624	48
Golden Fleshed Tankard	18	960	616	00

Second Series of Plots, sown 21st May.

Variety.	Yield per Acre.		Yield per Acre.	
	Tons.	Lbs.	Bush.	Lbs.
Golden Fleshed Tankard	17	1,904	598	24
Mammoth Long Red (Bruce)	17	1,376	589	36
Giant Yellow Intermediate	17	848	580	48
Selected Mammoth Long Red	14	1,744	495	34
Red Globe	14	1,568	492	48
Red Fleshed Tankard	14	1,568	492	48
Warden Globe	14	1,040	484	00
Yellow Globe	14	864	481	4
Mammoth Long Red (Steele)	14	864	481	4
Canadian Giant	12	1,696	428	16
Berkshire Prize	12	1,344	422	24
Red Globe Oberndorff	11	1,408	390	8

EXPERIMENTS WITH CARROTS.

Fifteen varieties of carrots were tested side by side in two sets of plots, one sown 10th May, the other 21st May. The yield per acre has been calculated from the weight harvested from three rows, 18 inches apart and 66 feet long. The earlier sown plots were harvested on 14th October, the second series 21st October. Soil sandy loam, no manure, but had a coating of unleached ashes, about 150 bushels to the acre in the autumn of 1891. Land ploughed in the autumn of 1891, disc harrowed twice in the spring of 1892 and harrowed twice with the smoothing harrow.

First Series of Plots, sown 10th May.

Variety.	Yield per Acre.		Yield per Acre.	
	Tons.	Lbs.	Bush.	Lbs.
Early Gem	27	1,147	919	7
Danver's Orange	25	1,040	850	40
Oxheart or Guerande	23	1,227	787	7
Chantenay	22	888	748	00
New Mammoth White Intermediate	21	827	713	47
Improved Short White	20	1,067	684	27
Giant White Belgian	19	1,307	655	7
Large White Vosges	17	1,200	586	40
Orange Giant	17	1,053	584	13
Mammoth Intermediate Smooth White	16	707	545	7
Iverson's Champion	16	560	542	40
Selected Altringham	15	1,093	518	13
Improved Half Long White	15	507	508	27
Giant Short White Vosges	14	1,627	493	47
Large White Belgian	14	1,333	488	53

Second Series of Plots, sown 21st May.

Variety.	Yield per acre.		Yield per acre.	
	Tons.	Lbs.	Bush.	Lbs.
Danver's Orange	26	1,680	894	40
Mammoth Intermediate Smooth White	26	800	880	00
Improved Short White	23	933	782	13
New Mammoth White Intermediate	22	1,173	752	53
Chantenay	21	1,120	718	40
Improved Half Long White	21	1,120	718	40
Early Gem	20	1,946	699	6
Iverson's Champion	19	1,600	660	00
Oxheart or Guerande	19	1,013	650	13
Orange Giant	18	960	616	00
Large White Vosges	18	960	616	00
Giant White Belgian	18	960	616	00
Giant Short White Vosges	15	800	513	20
Large White Belgian	12	1,520	425	20
Selected Altringham	11	800	381	20

EXPERIMENTS WITH SUGAR BEETS.

Seven varieties of sugar beets were sown in plots, one set on 10th of May, the second on the 21st. The rows were 18 inches apart and the yield per acre was calculated from the product of 3 rows each 33 feet long. In the arrangement of tests of roots these plots were located alongside the tests of carrots and the character of the soil and its treatment will be found under "Experiments with Carrots." The plots first sown were harvested on October 14th, the second set October 17th.

First Series of plots sown 10th May.

Variety.	Yield per Acre.		Yield per Acre.	
	Tons.	Lbs.	Bush.	Lbs.
Klein Wanzleben (1892)	15	1,680	528	00
Kruger	15	800	513	20
Vilmorin's No. 2	15	507	508	27
Klein Wanzleben (1891)	15	213	503	33
Brabant	14	1,627	493	47
Vilmorin's Improved	13	400	440	00
Vilmorin's No. 1	11	880	381	20

Second Series sown 21st May.

Variety.	Yield per Acre.		Yield per Acre.	
	Tons.	Lbs.	Bush.	Lbs.
Vilmorin's No. 1	23	1,813	796	53
Kruger	18	1,840	630	40
Vilmorin's No. 2	17	27	567	7
Brabant	13	1,867	464	27
Klein Wanzleben (1891)	12	640	410	40
Klein Wanzleben (1892)	11	1,467	391	7
Vilmorin's Improved	11	587	376	27

EXPERIMENTS WITH POTATOES.

Forty-eight varieties of potatoes have been tested, side by side, in rows 2½ feet apart, all planted on the 16th and 17th of May with pieces containing three eyes and placed one foot apart in the rows. They were harvested on the 4th and 5th of October. The soil was clay loam, previous crop wheat, stubble ploughed under lightly early in the fall to start shed grain and weeds, and cross ploughed later in the season, disc harrowed twice in the spring and once with smoothing harrow. Five crops had been taken from this land since operations began on the Experimental Farm and no manure or other fertilizer applied until the spring of 1892, when it received a dressing of Royal Canadian fertilizer in the proportion of 800 pounds to the acre. The plots varied in size, but in estimating the yield per acre it has been calculated in most cases from the product of two rows 66 feet long.

Variety.	Size of Plot.	Total Yield per Acre.		Yield per Acre of Marketable Potatoes.		Yield per Acre of Unmarketable Potatoes.		Weight of diseased potatoes per plot.
	Feet.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Lbs.
Everett	66 x 2½	407	00	363	00	44	00	5½
T. K. Fullerton, Calgary, N. W. T.	172 x 2½	389	24	330	00	59	24	0
Empire State	172 x 2½	380	36	294	48	85	48	0
Dakota Red	172 x 2½	369	36	327	48	41	48	0
Rural Blush	66 x 2½	367	24	319	00	48	24	0
Mr. Lemieux, Oak Lake, Man.	66 x 2½	365	12	330	00	35	12	0
Thorburn	172 x 2½	358	36	264	00	94	36	0
Early Sunrise	172 x 2½	343	12	259	36	83	36	0
Gleason's Late	172 x 2½	341	00	277	12	63	48	0
White Elephant	66 x 2½	338	48	303	36	35	12	½
State of Maine	172 x 2½	336	36	266	12	70	24	0
Nelson River, from	172 x 2½	336	36	242	00	94	36	0
Delaware	172 x 2½	327	48	270	36	57	12	0
Crown Jewel	172 x 2½	327	48	228	48	99	00	0
Clarke's No. 1	172 x 2½	321	12	224	24	96	48	0
Sharpe's Seedling	172 x 2½	316	48	228	48	88	00	0
Holborn Abundance	172 x 2½	316	48	231	00	85	48	0
Early Thorburn	172 x 2½	305	48	222	12	83	36	0
Daisy	172 x 2½	301	24	228	48	72	36	0
Summit	172 x 2½	299	12	231	00	68	12	0
Rosy Morn	172 x 2½	297	00	209	00	88	00	0
Algoma No. 3	172 x 2½	290	24	231	00	59	24	½
Vanguard	172 x 2½	288	12	198	00	90	12	0
Late Rose	172 x 2½	288	00	228	48	59	24	3
Wonder of the World	172 x 2½	283	48	224	24	59	24	0
Chas. Downing	172 x 2½	283	48	171	36	112	12	0
Burpee's Seedling	172 x 2½	283	48	165	00	118	48	0
Richter's Schneerose	172 x 2½	277	12	176	00	101	12	0
Burpee's Extra Early	172 x 2½	275	00	162	48	112	12	0
Careless Match	172 x 2½	270	36	215	36	55	00	6½
R. Debreau, Alberni, B. C.	172 x 2½	264	00	180	24	83	36	0
Halton Seedling	172 x 2½	261	48	189	12	72	36	0
Late Goodrich	172 x 2½	259	36	187	00	72	36	0
Early Eating	172 x 2½	259	36	158	24	101	12	0
Flower of Eden	172 x 2½	255	12	184	48	70	24	0
Beauty of Hebron	172 x 2½	255	12	176	00	79	12	0
Early Rose	172 x 2½	246	24	180	24	66	00	0
Vermont	172 x 2½	246	24	145	12	101	12	0
Green Mountain	172 x 2½	242	00	171	36	70	24	0
May Queen Early	172 x 2½	239	48	158	24	81	24	0
Early Puritan	172 x 2½	237	36	182	36	55	00	0
Rural No. 2	172 x 2½	231	00	171	36	59	24	0
Alexander Prolific	172 x 2½	220	00	147	24	72	36	0
London	172 x 2½	217	48	134	12	83	36	0
Lady's Finger	66 x 2½	180	24	...	...	...	...	0
Beauty of Beauties	172 x 2½	176	00	132	00	44	00	½
Eye Carpenter	172 x 2½	169	24	110	00	59	24	0
Stonewall	172 x 2½	77	00	39	36	37	24	0

In addition to those here named there were five or six of the leading sorts which have made a good record in former years, including Lee's Favourite, Algoma No. 1, Early Ohio, Chicago Market and Early Albino, which were planted on rather low ground, where the heavy rains which prevailed during the time of grain harvest so saturated the soil as to greatly injure the crop. For this reason the returns of these varieties are not given.

TESTING THE VITALITY OF GRAIN AND OTHER SEEDS.

The testing of the germinating power of seed grain and other seeds for farmers in the several provinces of the Dominion has been continued, and 1,370 samples have been tested. These samples are all tested in duplicate in order to reach greater accuracy and make the returns in every way reliable. This branch of the Experimental Farm work has rendered good service to many farmers by giving them such information as to the vitality of the grain they were holding for seed, as enabled them to choose those samples having a high germinating power, thus preparing the way for good crops. Samples can be sent to the Central Experimental Farm free through the mail; the quantity in each case should be about one ounce, and the returns giving the results of the test can usually be sent within ten days or a fortnight from the time the samples are received.

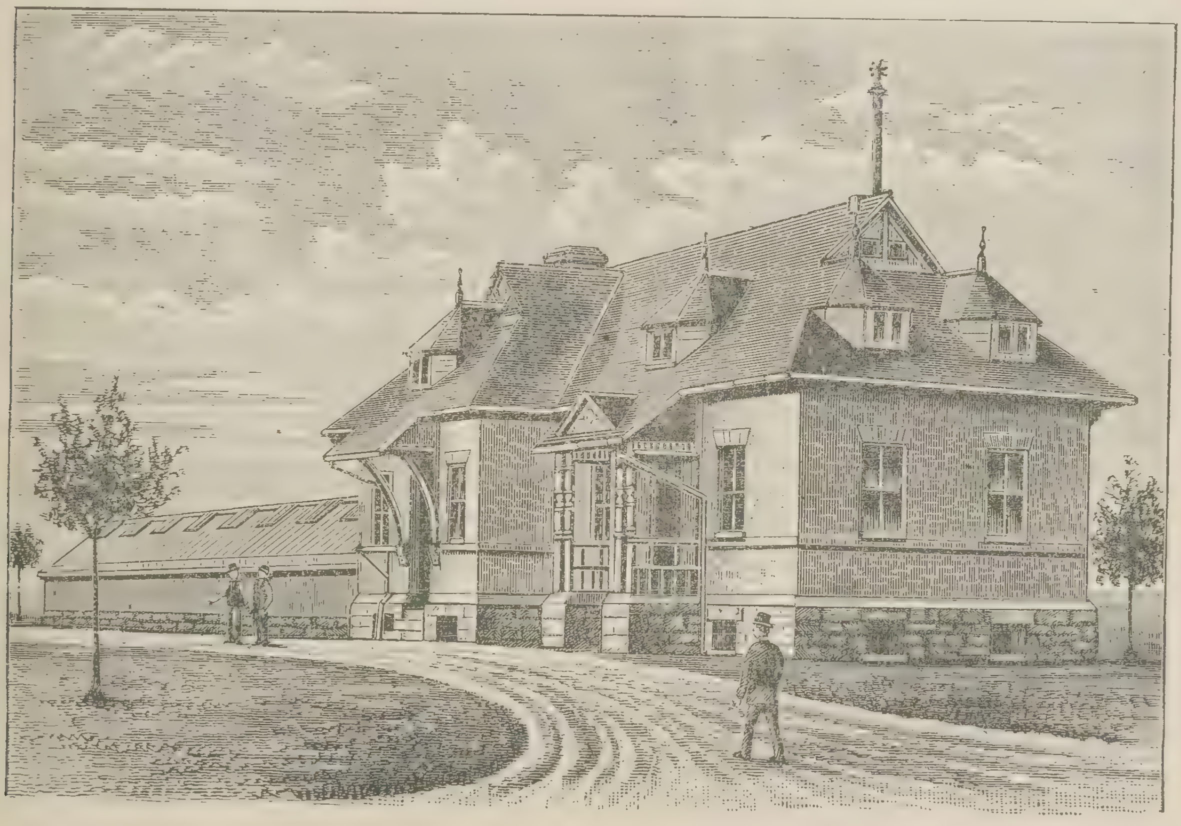


FIG. 2.—Building for seed testing and seed grain distribution.

The building which has been constructed for this purpose is shown in fig. 2, the glass structures in the rear are used for seed testing, while the front part affords accommodation for the distribution of samples of promising varieties of seed grain to farmers for test in all parts of the Dominion.

RESULTS of Grain Tests, 1891–92.

Kind of Seed.	Number of Tests.	Highest Percentage.	Lowest Percentage.	Average Vitality.
Wheat	442	100	0	85·7
Barley	284	100	19	85·0
Oats	431	100	25	93·3
Pease	67	100	8	90·4
Beans	42	100	60	84·8
Rye	11	93	46	78·0
Corn	17	100	0	73·3
Clover	4	88	63	76·0
Tares	4	97	76	85·5
Grass	6	44	0	18·6
Carrots	5	65	17	43·2
Turnips	3	75	18	55·6
Sugar beets	5	82	62	72·8
Cauliflower	3	60	19	42·3
Celery	3	0	0	0·0
Cabbage	9	95	26	57·3
Onion	4	60	0	39·2
Radish	4	85	35	59·5
Tomato	5	93	36	64·2
Pumpkin	2	62	60	61·0
Flower seeds	8	88	6	35·7
Rhubarb	1	....	....	16·0
Mangel	1	....	....	82·0
Cress	1	....	....	84·0
Lettuce	1	....	....	63·0
Parsley	1	....	....	54·0
Parsnips	1	....	....	30·0
Pepper	1	....	....	52·0
Sugarcane	1	....	....	22·0
Sage	1	....	....	1·0
Sweet majoram	1	....	....	11·0
Thyme	1	....	....	6·0
Total number of samples tested, highest and lowest percentage and average vitality	1,370	100	0	85·9

LADOGA WHEAT.

For many years past the importance of obtaining the earliest ripening varieties of grain which the world could furnish for test in the Canadian North-west, had impressed itself on the minds of many of those who took an interest in that country. In 1882 when the late Charles Gibb, of Abbotsford, Que., visited Russia in company with Pro. J. L. Budd, of Iowa, for the purpose of inquiring into the character and hardiness of the fruits grown in the northern parts of that country, he made inquiries also regarding the early ripening varieties of wheat to be found there. Having carefully studied the character of the climate, he ascertained that the season was short and that the climatic conditions in some parts of Russia closely resemble those which obtain in districts in the North-west Territories of Canada, and finding that some of the wheats in cultivation there ripened very early, he endeavoured to procure samples to bring home with him, but did not succeed in obtaining them. In conversation with him after his return, information was obtained as to the localities and sources where the most promising of the early ripening wheats would probably be found, and as soon as the experimental farm system was inaugurated, early in the winter of 1886, correspondence was opened with a noted seed dealer in Riga, Russia, Mr. E. Goegginger, who had made a special study of Russian cereals. Samples of the best Red Fife obtainable were sent to him, and he was requested to select from the varieties grown north of Riga, the earliest sort or sorts to be found, and if possible equal in quality to the best Red Fife. He was also requested to interest himself in obtaining for test on the experimental farms samples of other varieties grown as

far north in that country as the cultivation of wheat extended, so that opportunity might be had for testing here all the more promising sorts to be found in Northern Russia, with the hope of finding among them a hard wheat of good quality, which would ripen early enough to escape the autumn frosts, which sometimes injure the crop in some parts of the North-west country.

The variety which Mr. Goegginger recommended as most likely to meet the requirements of the case was the Ladoga, grown in latitude 60 near lake Ladoga north of St. Petersburgh and by latitude 600 miles north of the city of Winnipeg. This variety is said to be highly esteemed in Russia both for its quality and earliness. One hundred bushels of this wheat were ordered and received in Ottawa early in the spring of 1887, when samples were submitted to some of the leading millers and other expert judges who pronounced it to be a promising wheat which they believed would grade almost as high as No. 1 hard. The kernel was plump, longer than Red Fife but not so bright in colour and it weighed 61 lbs. per bushel. Samples of this grain weighing three lbs. each were distributed for test without delay to farmers in different parts of the Dominion, 277 of which went to Manitoba and the North-west Territories and 1,200 lbs. was forwarded by the Commissioner of Indian affairs to be distributed among the Indian agencies.

The demand from the North-west for samples of this grain was large and it was found necessary to order another 100 bushels from Riga which was received early in the spring of 1888. 275 reports were received from farmers who had tested the Ladoga in 1887, and 301 from those who tested it in 1888, and these show that the Ladoga had ripened on the average ten days earlier than the Red Fife wherever tested. A bulletin was issued on this subject (No. 4) in March, 1888, giving particulars of such information as was obtainable regarding this wheat to that date.

In order to form a correct judgment as to the quality of this grain as grown in this country, opinions were sought from the most competent judges and boards of experts in the Dominion. The most prominent among the Dominion grain inspectors, the largest millers, and the Boards of Trade at Montreal, Toronto and Winnipeg were all consulted. Eleven samples of Ladoga, four of which had been grown in Manitoba, four in the North-west Territories, and three in the Maritime Provinces, were selected for scrutiny. The samples sent to each were all out of the same bags, they were sent just as they were received from the growers; information was given as to the name of the variety, the names and addresses of the parties who had grown the samples, and an opinion asked for as to how these samples would grade in the markets of this country, if offered in quantity, and how they would compare in value with Red Fife. With reference to the purpose of this introduction, I quote the following from the letter which accompanied the specimens, "the object of this introduction is not by any means to displace the Red Fife. I think the growth of that variety should be encouraged in every practicable way, but the Minister of Agriculture desires that an earlier wheat of good quality should be secured to be grown where the Red Fife does not succeed, and thus discourage and prevent as far as is practicable the introduction of soft and inferior varieties of wheat, so that the present high standard of our North-west grain may be generally maintained." The opinions given on these samples, which were identically the same in each case, were most varied and conflicting. The same sample was pronounced "hard" by one board of experts, "soft" by another, "hard" by a third, but "worth 5 cents a bushel less than No. 1 hard," while a fourth judge pronounced it as "extra No. 1 hard."

Samples of the same lot were submitted for analysis to Mr. F. T. Shutt, Chemist of the Dominion Experimental Farms, and the results of his analyses published in Bulletin 4 show that the better samples of Ladoga contained as large a percentage of gluten as the best Red Fife, and the quality of a hard wheat is believed to depend mainly on the proportion of gluten it contains.

In November, 1888, sixteen bushels of Ladoga wheat which had been grown at the Experimental Farm at Indian Head were taken to the roller mill at Fort Qu'Appelle, N.W.T., with a similar quantity of Red Fife which had been grown in an adjacent field. The flour of the Ladoga, when compared with the Red Fife, was

found to have a yellow shade. Several sacks of flour from both these varieties were forwarded to Ottawa, and bread carefully made from each under my own supervision. The Ladoga was found to produce a drier flour than the Red Fife, and 100 lbs. of the Ladoga flour produced 2 lbs. more of bread than the same quantity of the other. The bread made from both samples had a yellowish tint, but the yellow colour was more pronounced in the bread made from the Ladoga flour. Samples of this bread were submitted to the members of the Committee on Agriculture of the House of Commons, then in session, and both pronounced of good quality

A sack of each sort of flour was sent to two of the leading bakers in Ottawa, who tested it carefully and submitted reports. One stated that the Ladoga was a stronger flour than the Red Fife and would make more bread to the barrel, but the colour of the bread made from it was not so good; the other was also of opinion that the Ladoga was the stronger flour of the two, but being darker in colour would not command so high a price as the Red Fife. Samples of the bread made from the Ladoga were sent to a number of people of good judgment in Ottawa, by whom it was pronounced to be of good quality.

In summing up the evidence brought together in Bulletin 4 I used the following words, which I thought were justified by the facts presented:—"The better samples of Ladoga are fully as rich in gluten as the best Red Fife, and while the cultivation of the Red Fife should be recommended in every section of the North-west, where it is likely with early sowing to escape the autumn frosts, the growth of the Ladoga may be safely encouraged wherever the ripening of the Red Fife is uncertain, without incurring the risk of materially lowering the reputation or the general quality of Canadian hard wheats."

In the annual reports of the experimental farms for the years 1889, 1890 and 1891 further particulars were given of the testing of this wheat, and it is shown that the quality of early ripening has been maintained throughout. Many efforts were made during the past two years to secure a sufficient quantity of Ladoga to make a thorough test at one of the larger mills as to the quality of the flour which could be made from it, as the early tests made in a small way were held to be insufficient and unreliable. Finally, Messrs. McLaughlin & Moore, of the Royal Dominion Mills, of Toronto, agreed to make a thorough test if a carload of this wheat could be procured for the purpose. On learning that it could be got in the Prince Albert district, where some of the farmers had grown Ladoga very successfully for several years, Mr. A. Mackay, Superintendent of the experimental farm at Indian Head, was requested to visit that locality early in the year and purchase the necessary quantity of pure Ladoga. This reached Toronto early in April, and on the 28th of that month the grinding was begun. I was present during the greater part of the day and saw the working of the wheat and was satisfied that the test was fairly conducted.

Several of the leading bakers in Toronto were supplied with the flour and several tests were made with it, and our chemist, Mr. F. T. Shutt, was sent to Toronto to be present at some of these tests. The following report has been submitted by Mr. Shutt:—

WM. SAUNDERS, Esq.

SIR,—I beg to report as follows, regarding the Ladoga baking test conducted in Toronto last May.

The wheat was ground by Messrs. McLaughlin & Moore, Royal Dominion Mills, Toronto. In an interview, Mr. McLaughlin expressed himself respecting the milling of Ladoga and the quality of the flour in the following terms: "Compared with Red Fife it grinds 'tough,' reducing the capacity of the mill—thus the output per hour was

Ladoga	16·3 barrels.
Red Fife	18·1 "

"These results, however, would not have been so adverse to Ladoga if the mill were run with it, say for a week. The present trial was for nine hours only. The cleaning process or separation of bran is more difficult in the case of the Ladoga,

though in this respect as well as in the grinding it ranks ahead of 'goose' wheat. It would yield about the same quantity of flour per bushel as No. 1 Hard, in which also the percentages of 'Bakers strong' and Low grade are similar to those from No. 1 Hard. It contains about the same percentage of gluten as No. 1 Hard. The flour is yellow compared with that from No. 1 Hard. Doubtless the flour would give better results after being allowed to age."

Through the courtesy of Mr. J. D. Nasmith, baking trials were made at his bakery, Adelaide street, Toronto.

The first three experiments were conducted by Mr. Nasmith on 4th, 5th and 10th May. He found that the third trial yielded much whiter bread than the first, owing to a modification in the method and time of working the sponge and dough. Mr. Nasmith obtained bread from Ladoga, at the third trial, which but for a slightly yellow tinge he considered equal to that from "Queen" (Patent) brand. He further is of opinion that it is a strong flour, and that the yellow colour may be dissipated to a great extent by allowing fermentation to proceed longer than usual. The sponge of Ladoga works quicker than that of Red Fife. In a comparative test, Mr. Nasmith obtained from 100 lbs. of "Queen" flour, 147 lbs. of bread; from 100 lbs. of "Ladoga" flour, 152 lbs. bread.

The following trials were made under my own supervision. The weights of flour, yeast, salt and water used, as well as of the sponge, dough and bread were carefully recorded. The baker used a sufficient quantity of water, according to his own judgment, to bring the sponge and dough in each case to the right consistency: the weight of the water used being noted. The sponge in each case was set for eleven hours, the initial temperature being 76°F. The temperature of the bake-house ranged from 70° to 72°F. throughout the night.

The "Queen" brand. This rose well in the sponge and "improved" in the pans, and the bread was very satisfactory in all respects. From 100 lbs. of flour, 140 lbs. 8 cz. of bread were baked.

The Ladoga flour.—At the end of the setting period (11 hours), the sponge was much "slacker" than that of the "Queen." It had evidently been allowed to ferment too long and had become "spent." It would not "improve" or rise in the pans and the resulting bread was yellow and "flat" compared with that from the Queen flour. From 100 lbs. of the flour, 145 lbs. 13 oz. of bread were obtained.

I would very briefly sum up as follows:—

1. That it is evident that the right conditions for obtaining the best results in baking Ladoga are not as yet well understood. Good, well risen white bread has been baked from Ladoga flour which on another occasion has yielded flat, heavy, yellowish bread. The public at present demand a white bread, and it is chiefly on this account I think, that the bakers are averse to Ladoga flour—the bread from it usually having a yellowish colour.

2. The physical character of the gluten is different from that of the Red Fife. It is somewhat inferior in colour and elasticity, and is more sticky. Age would most probably improve its quality. In percentage of gluten, however, it is fully equal to Red Fife—see Bulletin 4, Experimental Farm series.

3. The Ladoga is drier and consequently takes up more water and yields a larger weight of bread than the Red Fife flour. This I surmised from my analyses of the Red Fife and Ladoga flours given in the Bulletin above mentioned.

Your obedient servant,

FRANK T. SHUTT,

OTTAWA, January 2nd, 1893. *Chemist, Dominion Experimental Farms.*

On 9th of May Mr. McLaughlin wrote as follows:—"Mr. Coleman has tried the flour, so has Mr. Nasmith, but neither have yet made tests satisfactory to themselves. So far as we have seen of the bread it looks as if the colour was going to prove very yellow and the strength better than we anticipated, but nothing positive can be said until these bakers have made satisfactory tests." On the 10th he says: "In our yesterday's letter we said that so far as we had yet seen of the Ladoga bread it was going to prove very yellow. To-day we have samples from both bakers which are surprisingly different from the samples on which we based the "very

yellow" opinion. Mr. Nasmith, I think, intends sending you some loaves of bread which if they reach you in good order, will do something to confirm your faith in Ladoga. We shall not venture any further opinion until the bakers have made their final tests." On the same day Mr. J. D. Nasmith writes as follows:—"I sent you to-day by express three loaves, two from the Ladoga flour, the other one is from McLaughlin's 'Queen.' The first comparative trial a week ago was surprising, establishing strength enough, but such a very yellow colour as I never saw before in bread. To-day's sample if it reaches you in time, I know will gratify you as it did me, I did not at all anticipate such results from first trial." When this bread arrived I was absent from home and did not return for several weeks when the bread was spoilt. Those who saw it and tested it while fresh pronounced it excellent.

Nothing further was heard on this subject until 14th June, when Mr. McLaughlin wrote again as follows:—"We have now had sufficient experience with the Ladoga flour to satisfy us that it is never going to be a favorite with bakers. Nasmith has not been able to repeat the loaf he sent you, and Coleman condemns it in unstinted terms, a third man, B. Woodman of Parkdale, to whom we sent some had quite as bad an experience as Coleman. These are the only three to whom we have sent the flour. Certainly the bread—all but that one sample of Nasmith's—was unfit for Toronto trade."

Mr. McLaughlin's final report on this subject was written on the 25th August and reads as follows:—

TORONTO, 25th August, 1892.

Prof. WM. SAUNDERS,
Director of the Dominion Experimental Farms,
Ottawa.

DEAR SIR,—On the 28th April last, we ground 600 bushels Ladoga wheat shipped to us from Prince Albert, N.W.T.

The wheat was in good condition, fairly plump, free from smut or frost and very uniform.

In grinding it worked quite different from ordinary Manitoba hard wheat, being harder to reduce and requiring more power. In this respect it resembled goose wheat more than any other variety.

We sent some of the "Patent" and some of the "Strong Bakers" flour to different bakers in Toronto, telling them what it was, and requesting them to be as careful in their baking tests as we had been in milling it.

In every test the flours were pronounced inferior to the flours from ordinary No. 1 and No. 2 hard Manitoba wheat.

In all cases the deficiency in strength, the very yellow colour, and the coarse texture of the bread were the evils complained of.

No baker who tested it could be persuaded to buy the flours afterwards, even at a considerable reduction in price from the price of flours similarly made from No. 2 hard Manitoba.

Later tests, after the flours had been six weeks old, resulted no better.

Baked as household flour, the Ladoga Patent and Strong Bakers worked fairly and made bread that was up to the quality of much that is used in some places, but not good enough for people who are particular as to appearance as well as taste.

Our different experiences with this flour lead us to this conclusion:

Good unfrosted Ladoga wheat, such as the lot we ground, will make better flour than No. 2 regular Manitoba wheat, but not as good as No. 1 regular Manitoba.

We still have some of both grades of the Ladoga flour on hand, which we would be pleased to dispose of to anyone who wished to test it further.

We are yours very truly,

McLAUGHLIN & MOORE.

From the facts submitted it would appear that while it is possible to make good bread from Ladoga flour it is much easier to make bread of an inferior quality, and unless the proper methods for treating this flour to procure uniformly good results

could be ascertained it is not likely that Ladoga will be acceptable either to millers or bakers as long as the flour of the Red Fife is obtainable. Hence wherever Red Fife can be ripened, the efforts of those settlers engaged in wheat growing should be directed to its production in the greatest perfection by early sowing and a proper preparation of the soil. It is to be regretted that the Ladoga wheat has not in quality more fully realized the hopes which were first based on it. Since Bulletin No. 4 was published it has been found that the gluten in different varieties of wheat, although responding alike to chemical tests, varies in its physical properties of toughness and elasticity and that in these particulars, the gluten in Red Fife is superior to that in most other wheats.

The presentation of this case of the Ladoga would not however be complete without quoting from some of the letters which have been received in favour of this grain. It is undoubtedly a week or ten days earlier in ripening than Red Fife and there is no early variety among all the spring wheats which we have tested which has more good points than Ladoga. Some of the varieties imported from India are as early, but they are such poor yielders that no farmer would care to grow them, and no sufficient quantity has been grown here to admit of their being tested by the millers. Many cross-bred varieties have been produced at the Central farm, between Red Fife and these early sorts with the hope of originating new wheats equal in quality to Red Fife and earlier. Until these new sorts are multiplied and their relative value ascertained, settlers in the Canadian North-west would do well to devote their attention to the growing of Red Fife, and place it under such conditions as to give it every chance of maturing since no other wheat is yet to be had which will give the same satisfactory returns, both for home and foreign trade.

As samples of testimony from settlers and others in favour of Ladoga the following are submitted and many more such might be given. Mr. John Eccles of Stony Plain, Edmonton, North-west Territories, writes on March 7th, 1892, as follows: I sowed a couple of acres of Ladoga last year on the same day as my Red Fife, and reaped it 14 days earlier. It was a splendid crop perfectly free from smut. I consider it a first class wheat, I had a grist ground at the mill, and I never want a better quality of flour, notwithstanding the reports to the contrary.

Mr. Henry H. Hayward, of Hayward, Assa., writes under date of March 26th, 1892, and says: "In the spring of 1889, I sowed a 3 lb. sample of the Ladoga wheat which you were kind enough to send me, and in the fall of last year 1891, I threshed 174 bushels, the result of the 3 lb. sample. The 19th of this month I took to the roller mills at Fort Qu'Appelle, 51 bushels to be tested as to what sort of flour it would make. The amount I received in flour was 38 lbs. of the best, and about 3 lbs. of poor grade per bushel of 60 lbs. I may say that the sample of wheat was a fair one, there being no trace of smut in it. The grain was much lodged by a storm which caused great waste in harvesting, yet I threshed 35 bushels to the acre:" a sample of the flour was sent by Mr. Hayward of that part of the grist which was supposed to be perfectly pure and it appeared to be very good but a little yellow in colour.

Mr. Alex. McGibbon, Inspector of Indian agencies, writes on November 12, 1892, from Onion Lake Reserve, 100 miles north west of Battleford, and says: "I take the liberty of sending you a sample of Ladoga wheat, grown on this agency. It was tried for the first time this year. The Indian fields gave a return of 12 bushels per acre, but it was badly damaged by gophers, the season being very dry. Half an acre sown by the agent in his own field and which received attention gave a return at the rate of 44 bushels per acre. The whole of this lot is equal to the sample I send you. It was sown on the 22nd of April and harvested on the 3rd of September." The sample sent by Mr. McGibbon was very fine and plump.

The agent at Onion Lake Reserve, Mr. G. G. Mann, in a recent report to the Department of Indian Affairs says: "All the wheat was saved without damage by frost, the yield being very poor with the exception of the few bushels of Ladoga wheat which turned out fairly well. In consequence of this I have asked in my 1893 estimates for a supply of 200 bushels of Ladoga for seed which if supplied will I am certain turn out very well as it ripens so much earlier than the old grade of wheat

there would be no danger from frost. " Favourable reports have also been received from other Indian agencies in the north concerning the sucessful growth of this wheat.

I am indebted to Mr. C. C. Chipman, Commissioner for the Hudson Bay Co., for the privilege of sending to a number of the posts of that company in the far northern districts of the Dominion samples of grain of one pound each for test and report. These were sent in the autumn of 1891 to be grown in 1892. The officer in charge of Fort Vermilion, Athabasca district, about 520 miles north-west of Calgary, writes as follows. The seed was sown on the 14th of May last and harvested on the 23rd of August. There was no rain whatever for three weeks after the seed was sown. The Red Fife did not head out at all, the yield of the Ladoga was 12 lbs., weighing 60 lbs. per bushel. Bonanza oats, 9 lbs.; Prize Cluster oats, 7 lbs.; Rennie's improved six-rowed barley, 16 lbs; Spring rye, 18 lbs. Through the kind courtesy of Mr. Chipman I have received samples of these different sorts of grain.

Samples have also come in from the same source from Fort Simpson in the Mackenzie River District, about 750 miles north-west of Calgary. The officer in charge of that post writes as follows: " The kinds of grain sown were Ladoga wheat, Rennie's six-rowed barley and Bonanza oats. The two latter never ripened, but the wheat yielded 12 lbs, of good ripe grain. The date at which these varieties were planted here was the 7th of June and the wheat was harvested on September 22nd." The Ladoga in this instance weighed 62¼ lbs. per bushel.

A very fine sample of Ladoga wheat was received last year grown at Dunvegan in the Peace River District, about 340 miles north west of Calgary, which weighed 64 lbs. per bushel. A sample has also been received grown at Isle à la Crosse, about 170 miles north of Prince Albert, weighing 64 lbs. per bushel. No other wheat has ever given such results as these in those distant northern regions. While these tests and experiments with the Ladoga have been in progress, a large acreage has been devoted on each of the Experimental Farms at Indian Head, North-west Territories and Brandon, Manitoba, to the growth of pure Red Fife, for the purpose of supplying farmers whose seed had become mixed, with pure grain for a fresh start; and it is proposed to continue this work on a still larger scale in future, so that the means may be afforded of renewing the stock of this valuable grain from time to time from a pure source. Many farmers in the west have had forwarded to them from Ontario during the past few years, samples of eastern soft wheats for trial, and in this way White Russian, Colorado, Red Fern, Golden Drop and other varieties have been introduced and in some localities grown to a considerable extent. Although these varieties soon harden in that climate and some of them are then difficult to distinguish from Red Fife, they do not contain the quality of gluten which is found in the Red Fife; and any considerable admixture of any inferior sort will sooner or later lower the character and probably reduce to some extent the price paid for hard wheats. It has been supposed by some people who have not inquired very closely into the matter and who are not conversant with the peculiarities of the different varieties that all the soft wheats grown in Manitoba and the North-west Territories are Ladoga. The Ladoga is not and never has been in our experience a soft wheat and there is no doubt that the quantities grown in the North-west of the other varieties referred to far exceed the quantity of Ladoga which has been produced. While the idea of growing Ladoga wheat as a competitor with Red Fife for export or the general home trade, should be abandoned, there is no doubt that the flour of the Ladoga makes excellent and nutritious bread for home use, and where wheat growing is carried on in the more northern districts in a limited way for home consumption, and where Red Fife seldom ripens, or on the Indian Reserves where a yellow tint in the bread is not a matter of so much significance, the Ladoga wheat will still prove a most useful and desirable variety.

HUNGARIAN WHEAT AND FLOUR.

For some time past inquiries have been in progress as to the reason why the best Hungarian flour uniformly commands in the markets of Great Britain a higher

price than the best Canadian or American. Efforts have also been made to secure samples of the best Hungarian wheat for test in this country, but since all the Hungarian wheat is ground at home and the flour only exported these endeavours have not yet been successful. In September last my assistant in experimental field work, Mr. Wm. T. Macoun, visited Europe and was requested to make some inquiries into this subject and endeavour to procure samples of the grain, and through his efforts it is expected that a small supply will be available in time for spring sowing. He was also requested to visit the experimental grounds at Rothamstead and Woburn, also those of Vilmorin and Andrieux, near Paris, France. On his return he submitted the following report:—

Prof. Wm. Saunders,
Director, Experimental Farms.

Dear Sir,—In accordance with instructions received from you I made inquiries, while in Liverpool, regarding the Hungarian flour.

I went to the Canadian Office and presented your letter of introduction, but Mr. Dyke, having sailed for Canada, the letter was given to Mr. Mitchell who kindly took me to H. C. Woodward, an expert in grain.

Mr. Woodward told me that it was not because the Hungarian flour was manufactured from a better wheat than others that it commanded so high a price on the market, but that Hungary was one of the first, or the first country to introduce the improved apparatus for making flour; and that, having a reputation of long standing, the flour was sought for by customers who had used it a long time, and that the supply not equalling the demand the price was necessarily higher. He did not think that the Hungarian wheat would have any advantage over our own wheats, which produced strong flour.

When, in London, I called at the Canadian Office and presented your letter of introduction to Mr. Colmer, who gave me a letter to Mr. R. Dunham of "The Miller." Mr. Dunham said that he knew the Hungarian flour well; that it was stronger than the Red Fife or other milling wheats, and that it would make more weight of bread, from a given quantity of flour, than other varieties. The Red Fife, he said, made a higher loaf, the quality of the gluten being different. He said also that the kneaders in the bakeries in England get small pay, and will not work hard enough to put the amount of strength into the kneading that is required, the Hungarian being harder to work, and that from this cause the bakers do not buy it, hence the slow demand. He believes that the climatic conditions of that part of Hungary from which the flour comes are better than Manitoba or the North-west, and that the wheat is better on this account than our own. None of the Hungarian wheat is imported into England, but Mr. Dunham promised to send me a pound, which he had, to my boarding house in London, but this did not reach me. He expressed his willingness to obtain some for you from Hungary if so desired.

After having obtained the above information, I thought it advisable to visit the office of R. Hunter Craig & Co., flour importers and dealers in Hungarian flour, whose price lists I had with me.

They told me that the reason the Hungarian flour commanded such a high price is that the best flour only is imported, the natives using the poorer grades. The Hungarians also make more grades of flour than other millers, their machinery is excellent, and the flour is strong.

The demand is slow in England because the buyers are content with other sorts of flour which, though somewhat poorer than the Hungarian, make excellent bread. I was also told that the supply was not scant, but that plenty could be got. The wheat, they thought, must be good. They kindly furnished me with samples of the first and second grades of the Hungarian flour. I was told also that they believed that the Hungarians were much more particular in selecting their wheat for milling than the Canadians or Americans, and that for this reason the quality of the flour was improved.

Visit to Rothamsted.

On September 8, I visited Rothamsted, the home and experiment grounds of Sir John Lawes. Unfortunately he was absent in Scotland, and Dr. Gilbert also was about to leave, but he kindly provided me with a guide who was well acquainted with the work that was being carried on.

We first visited the sample room containing some thousands of samples of soil and grain which had been taken from the various plots, year after year up to the present time, for analysis.

On the way to the laboratory some boxes containing leguminous plants were pointed out to me. These boxes were so constructed that at any time the roots could be exposed and photographed. This was in connection with experiments made to prove the fixation of free nitrogen by the nodules of the roots of the leguminous plants.

No chemical work was being carried on in the laboratory, as the chemists were away. There was an interesting exhibit of grasses here from fertilized plots, which were, at one time, part of a meadow. The influence which various fertilizers had in producing more or less growth, according to the kind and quantity used, on the varieties of grasses and plants of which the original meadow was composed, was clearly shown. The mineral fertilizers seemed to increase the growth of leguminous plants in a very marked degree.

We visited a small glass house where a few pots of clover were placed. The soil in the first was pure sand, the second was pure sand with a very small quantity of garden soil, and the third garden soil. The reason why the garden soil was put in the second pot was to start the plants growing and the further growth was expected to be caused by the fixation of the free nitrogen of the air by the root nodules. Certainly the plants in the second were far ahead of those in the first pot, there was much more difference than the slight amount of garden soil could cause.

We visited next the rotation field, mangels being the principal crop this year. These plots have had various fertilizers for years. Certainly the unfertilized plot did not amount to much.

The next point of interest was the gigantic rain gauge $\frac{1}{1000}$ of an acre in diameter; also a drain gauge of the same size showing what percentage of water percolated through the soil. We then came to the root field in which were plots of mangels having various fertilizers, and next to the permanent grass plots from which the samples of grass already mentioned had been taken. It was remarkable how much the fertilizers had changed the character of the herbage, some plots having large quantities of leguminous plants while in others they had nearly disappeared.

The grain fields were also visited but they had been bereft of their crop and the land was partly ploughed.

In the middle of each plot and running lengthwise from one end to the other was a tile drain. The outlet is left open and the water analysed to find how much of the fertilizer drains through the soil. Nitrates, fall sown, drained away to a very large extent before spring. The effects of an application of farmyard manure seemed to be felt long after that of artificial fertilizers.

The soil of Rothamsted is a clay loam and many of the fields are thickly bestrewn with small flint stones.

Visit to Royal Agricultural Society's Experiment Grounds, Woburn Sands, Eng.

On Sept. 9th, I took the train from London for Woburn Sands, about 50 miles distant.

There are about 40 acres under experiment here, and Mr. A. E. Elliott is in charge. He kindly showed me what was of interest, but the grain having been harvested there was not very much to see. There were, however, a few $\frac{1}{10}$ acre plots of wheat in the field which had been grown to test the relative yield of the different varieties. These were not very good samples having been hurt by rain.

An experiment with a mixture for the prevention of potato rot was being carried on, but as the potatoes had not been dug, I could not get any results. The

mixture was applied on early, medium, and late potatoes. One section of each plot was treated, shortly after the potatoes were up, another when the potatoes were well grown but showing no signs of rot, another when the vine showed the first signs of decay, The following are the two mixtures used :

1st. 20 lbs freshly burned lime.
20 lbs sulphate of copper.
20 lbs molasses.
100 gals. water.

2nd. Same as the first without the molasses.

The plots were of three sizes: $\frac{1}{4}$, $\frac{1}{8}$, and $\frac{3}{8}$ of an acre.

A few steers are fed during the winter on different rations.

The different sorts of grain when harvested are kept separate while stacked, with oat straw which can be readily distinguished from the wheat straw. When threshing, a large rick sheet is placed under the threshing machine and after each sample is put through, the machine is kept running for some minutes after the last of the grain has been taken out in order to clean it thoroughly. The sheet under the threshing machine is also carefully swept each time.

The soil is of a dark sandy loam.

The experiments with fertilizers at this station are the same as those which are being carried on at Rothamsted.

Visit to Experimental Grounds of H. Vilmorin, Esq., Verrières, France.

On October 10, I visited the office of Vilmorin & Andrieux, rue de la Mégesserie, Paris. I saw Mr. H. Vilmorin, presented your letter, and he kindly invited me to visit his experiment grounds at Verrières, about ten miles from Paris. Accordingly, early the next morning I took the train from Paris to Massy, and from Massy station to Verrières by conveyance.

Mr. Vilmorin has 100 acres of land at this place, where he resides with his family during the summer.

Seeds of all sorts intended for future distribution are originated on this estate. As soon as a sufficient quantity of a new variety is obtained it is sent to various farmers throughout France to be multiplied, and afterwards samples of each growing are finally tested at Verrières, and their purity, trueness to type, germinating power and good points noted, and such as are found to be suitable for further distribution are placed in stock for market.

In going over the grounds we passed small grass plots, also plots of celery, carrots, mangels, beets, turnips and cabbages. The roots were just being dug, and they were laid in rows while one of the employees took notes of the percentage of well and ill-shaped specimens, also of size, etc.

Mr. Vilmorin showed me very many specimens of cross-bred grain, of which there were some remarkable types: some resembling spelt wheats when neither of the parents were of this class, and some having black beards while the parents had not, and many like curiosities.

He said that he did not know any plan for shortening the period of fixing types, but he discarded all those that sported much, even though they were promising sorts, retaining those that either did not sport or sported very little, if they were promising.

He had never succeeded in making any crosses between two and six-rowed barley, but believed it could be done, he did not believe that wheat and rye could be hybridized.

His large collection of grain is very interesting. He has also a laboratory where considerable work is done in analyzing beets to ascertain the percentage of sugar.

Yours respectfully,

WM. T. MACOUN.

FORESTRY.

The question of tree planting for shelter for buildings, stock, fruit and vegetable gardens and crops generally, is attracting increased attention from year to year, and information is being sought on the subject from every quarter, but more particularly from those parts of Canada where trees are scarce or wanting. To stimulate and meet this spirit of inquiry, there has, during the past four years, been sent from the Central Experimental Farm about 5,000 bundles of young trees, about 100 in each package, consisting mainly of very hardy sorts with a few less hardy varieties added for test. These have been distributed mainly among farmers residing in those parts of the North-west plains, where the want of trees is most urgently felt. Experience has shown that the native trees succeed best, and at the outset these should claim almost the sole attention of the planter; but after some shelter has thus been provided, additional varieties may be more successfully introduced to give variety and added beauty to the plantation.

In the autumn of 1890 tree seeds were very abundant in the valleys and bluffs of Manitoba and the North-west Territories, and through the efforts of Messrs. Bedford and Mackay, the Superintendents of the Experimental Farms at Brandon and Indian Head, about three tons of these seeds were secured, chiefly of box elder or Manitoba maple (*Negundo aceroides*) and green ash (*Fraxinus viridis*). Large quantities of these seeds were sown on the western experimental farms, and from the plantations raised many thousands of young trees have been distributed among the settlers; besides this, 4,053 bags, each containing about a pound of seeds were sent by mail to farmers who applied for them with instructions as to sowing and care of the young trees. As a result of this action young plantations of trees are now to be found in every part of the North-west, which, in a very few years, will furnish most desirable and beneficent shelter, and at the same time adorn the homes of the settlers.

In 1891 a severe frost in the spring destroyed the blossoms on the native trees and seed was not obtainable that year, but, during the past season 1892, tree seeds have been again abundant, and the methods employed in 1890 have once more been put in operation, and another three tons have been collected. These are now being distributed in a manner similar to that adopted in the spring of 1891. The native trees in the North-west bear seed early, usually in about six or seven years from the time of sowing, and when these thousands of young plantations reach the degree of maturity necessary to produce seed, such tree seeds will be available in almost every district for enlarging and extending the area planted, and with the material thus available, an immense impetus will be given to tree planting. The large plantations which have been put out on each of the Experimental Farms will also yield annually a large quantity of such seed. In the appended report of the horticulturist, will be found some particulars of the distribution made during the past year.

To provide shelter and to add to the attractiveness of the Central Experimental Farm, as well as to give information as to the rate of growth in this climate of the different sorts of useful timber trees, large belts of young trees have been planted along the western and northern boundaries of the farm, which are making good growth. The avenues lining the principal roadways, the hedges also, and clumps of ornamental trees are all doing well.

METEOROLOGICAL OBSERVATIONS.

TABLE of meteorological observations taken at the Central Experimental Farme Ottawa, 1892; maximum and minimum temperature for each month, with dat, of occurence; also rainfall and snowfall.

—	Maximum.	Date.	Minimum.	Date.	Rain-fall.	Snow-fall.
	°		°		in.	in.
January	37·2	12th	−24·2	20th	·22	31·0
February	43·5	23rd	−16·8	14th	....	26·0
March	42·3	28th	−10·0	16th	·22	21·0
April	66·4	28th	14·6	24th	1 83	....
May	84·6	31st	31·0	1st	1·68	....
June	90·3	13th	45·8	15th	6·19	....
July	96·6	29th	44·5	5th	2·62	....
August	87·5	18th	46·5	28th	4·21	....
September	82·5	4th	33·5	8th	2·06	....
October	70·2	14th	26 9	12th	1·45	....
November	58·0	18th	13·2	23rd	3·12	6·0
December	36·9	15th	−18·3	26th	·18	21·0
					23 78	105·0

Rain or snow fell on 180 days during the year.
Heaviest rainfall in 24 hours, 1·96 in., on June 20th.
Heaviest snowfall in 24 hours, 8·00 in., on Feb. 8th and Mar. 11th.
During June rain fell on 23 days.
September shows the lowest number of days on which rain fell during the summer months, viz., 11.

WM. ELLIS,
In charge of observations.

CORRESPONDENCE.

The following is a summary of the letters received and despatched at the Central Experimental Farm during the year 1892:—

—	Letters Received.	Letters Sent.
Director	11,223	10,696
Agriculturist	3,489	3,116
Horticulturist	1,044	971
Chemist	722	733
Entomologist and Botanist	1,697	1,559
Poultry Manager	457	458
Accountant	1,224	1,009
	19,856	18,542

ACKNOWLEDGMENTS.

I desire again to bear testimony to the faithfulness with which all the officers and employees at the Central and Branch Experimental Farms have discharged their respective duties. The volume of work done at the several farms can only be partially presented in the annual report for want of space. The increasing demand

from year to year from farmers for copies of these reports may be taken as an indication of their value, and the estimation in which the work is held by those best capable of judging of its usefulness. For the details of the work submitted which has been done on the Central Experimental Farm, I am again largely indebted to the careful and accurate observations of my assistant in the experimental field work, Mr. W. T. Macoun and also to Mr. John Fixter the farm foreman, who in addition to the faithful discharge of his regular duties has taken daily notes during the growing season on the condition and progress of many of the varieties of cereals, field roots and other agricultural crops under test. To Mr. Wm. Ellis my thanks are also due for faithful services rendered in connection with the important work of seed testing and the care of a valuable collection of economic and other plants in the greenhouses under his care.

WM. SAUNDERS,
Director, Dominion Experimental Farms.

REPORT OF THE AGRICULTURIST.

(JAS. W. ROBERTSON.)

To WM. SAUNDERS, Esq.,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to report upon the progress of the divisions of the work at the Central Experimental Farm, which have been under my care during 1892.

These included, (1) some experiments in the feeding of cattle, (2) experiments in the fattening of swine, (3) experiments in the creaming of milk by different methods, (4) experiments in the making of butter, and (5) the growth of fodder crops upon the forty-acre lot for the feeding of cattle. As far as conclusions can be drawn from them at the present time for the information and guidance of the farmers of Canada, a brief record of these experiments has been presented in this report.

Experimental investigations have been in progress to discover the effect upon the quality, quantity and composition of the milk of cows, from feeding them upon rations of different and progressive degrees of richness in meal. A special bulletin on that subject will be issued after these investigations have been carried far enough to yield reliable information.

As had been the case during the two previous years, the duties of my office as Dairy Commissioner for the Dominion, occupied the greater part of my time. In that capacity I was called from home frequently, to visit the branch Experimental Dairy Stations, to inaugurate and supervise the work of travelling dairies, and to attend conventions of farmers and dairymen. In all thirty-six public conventions or meetings, of from one to three sessions each, were attended during the year. I also visited Great Britain with the main object of securing the introduction of Canadian winter-made creamery butter into the markets there in the best way. During the few weeks which I spent in England and Scotland, I was able to render other service, incidentally, to the agricultural interests of Canada. My report as Dairy Commissioner, which will be brought down to 30th June, 1893, will contain a fairly complete statement of the work which has been done and the progress which has been made.

The educational and experimental work of the Dairy Commissioner has been initiated now in all the provinces except British Columbia and the North-west Territories, upon lines which promise to lead to great financial benefit to the farmers in them, from the development of dairying. It has been my good fortune to be able to co-operate with the Departments of Agriculture of the several provinces and with the Provincial Farmers' and Dairymen's Associations, in joint efforts to improve the methods of dairy farming. My assistants in the Dairy Commissioner's branch of the work, have rendered most efficient service. In view of these facts, I am hopeful that I may be able hereafter to devote a larger share of my time to the work which may come under my charge at the Central Experimental Farm. For the faithful work which they have performed and the valuable assistance which they have rendered, I desire to mention with particular commendation, Mr. John Fixter, farm foreman; Mr. R. R. Elliott, herdsman, and Mr. Chr. Marker, butter maker and superintendent of experiments in the dairy building.

I have the honour to be, sir,
Your obedient servant,
JAS. W. ROBERTSON,
Agriculturist.

PART I.—THE FEEDING OF STEERS.

Experiments in the fattening of steers were begun at the Central Experimental Farm in December, 1890. The main object of the first experiments, was to obtain information upon the relative cost of fattening steers, (1) upon a ration of which the bulky-fodder portion was mainly corn ensilage, hay and roots, (2) upon a ration of which the bulky-fodder portion was mainly hay and roots, and (3) upon a ration of which the bulky-fodder portion was mainly corn ensilage.

Six 2-year-old steers were purchased and were sorted into three lots, as nearly even in quality and size as possible. They were apparently all Shorthorn grades. On 1st December the average weight per head was 1,135 lbs. During the test (which lasted from 1st December to 18th May), they were weighed once every week and the feed they consumed was weighed every day. They had free access to water in a trough in front of the stalls, and a supply of salt was provided at the side of each manger. The preparatory period of feeding lasted from 1st December to 29th December, and during it all the animals were fed upon the same ration.

The three experimental rations were composed as shown in the following Table:—

TABLE I.

Ration No. 1.	Lbs.	Ration No. 2.	Lbs.	Ration No. 3.	Lbs.
Corn ensilage............	20			Corn ensilage............	50
Hay (cut)................	10	Hay (cut)	20		
Roots.............. ...	20	Roots.	40		
Straw (cut)......	5	Straw (cut)............	5	Straw (cut)..	5
Oil-cake..........	1	Oil-cake.......	1	Oil-cake................	1
Cotton-seed meal...	1	Cotton-seed meal... . ..	1	Cotton-seed meal..	1
Pease (ground)...........	2	Pease (ground)........	2	Pease (ground)...........	2
Barley (ground...........	2	Barley (ground).........	2	Barley (ground)...........	2
	61		71		61

For a period of five weeks from the 17th March to the 20th April, an additional 1 lb. each of oil-cake and cotton-seed meal were put into each ration.

For the purpose of obtaining some data which would be understood easily and remembered readily by the farmers, and which would afford means for making a comparison between the cost of feeding the steers on the three different rations, a cash value was estimated for the component fodders in each. The hay was valued at $8 per ton; roots (turnips and mangels) at $4 per ton; straw at $4 per ton; oil-cake and cotton-seed meal at $30 per ton; pease and barley at $20 per ton; and corn ensilage at $1.40 per ton. The corn ensilage was placed at the actual cost, as per statement in Bulletin No. 12, and the other fodders at an estimated valuation, which may be high or low, according to ever fluctuating circumstances of seasons and markets.

Table II shows, (1) the increase in weight of each steer after 20 weeks, (2) the average quantity of feed consumed per day per head, and (3) the average cost per head per day for feed consumed.

TABLE II.

RATIONS.		Increase in weight.	Feed consumed.	Cost per head per day
		lbs.	lbs.	cents.
No. 1.	Hay, roots, corn ensilage and meal	128	52·8	15·58
	do	182		
No. 2.	Hay, roots and meal	188	55·5	19·23
	do	179		
No. 3.	Corn ensilage and meal	221	60·	11·90
	do	212		

Conclusions. From these tests it appears that:—

(1.) During the feeding period of 20 weeks, the steers which were fed upon ration No. 3, (corn ensilage and meal), gained in weight, on the average, 33 lbs. per head more, and cost 7·33 cents per head less, per day for feed consumed, than the steers which were fed upon ration No. 2, (hay, roots and meal);

(2.) During the feeding period of 20 weeks, the steers which were fed upon ration No. 3, (corn ensilage and meal), gained in weight, on the average, 61½ lbs. per head more, and cost 3·68 cents per head less, per day for feed consumed, than the steers which were fed upon ration No. 1, (hay, roots, corn ensilage and meal);

(3.) When the experiment was ended, the steers which were fed upon ration No. 2, (corn ensilage and meal) were in the most attractive condition of the three lots for handling and selling;

(4.) A ration of which the bulky-fodder portion was mainly corn ensilage, was more profitable for the fattening of steers, than a ration of which the bulky-fodder portion was mainly or wholly hay and roots.

EXPERIMENTS IN 1891–92.

The experiments in the feeding of steers during the winter of 1891–92, were planned,—

(1.) To obtain further information upon the relative cost of fattening steers upon a ration of which the bulky-fodder portion was mainly, (*a*) in the one case, corn ensilage, hay and roots, (*b*) in another case, hay and roots, and (*c*) in the third case, corn ensilage,—

(2.) To discover the comparative values of feed consumed, per 100 lbs. of increase in live weight, by 3-year-old steers, 2-year-old steers, 1-year-old steers and calf-steers respectively.

THE FATTENING OF TWO-YEAR-OLD STEERS.

Eight 2-year-old steers were purchased and were sorted into four lots as nearly even in quality and size as possible. They were apparently all Shorthorn grades.

The preparatory feeding period lasted from October 29 to December 1, and during it the animals were all fed upon the following ration:—

	Lbs.
Corn ensilage	25
Roots	50
Straw (cut)	15
Pease (ground)	3
Barley (ground)	3
	96

They were each allowed as much of the mixture as they would eat.

On October 29 the average weight per head was 1,079 lbs., and on December 1 it was 1,155 lbs., showing a gain of 76 lbs. per head.

Three rations were composed as in Table III.

TABLE III.

Ration No. 1.	Lbs.	Ration No. 2.	Lbs.	Ration No. 3.	Lbs.
Corn ensilage	20			Corn ensilage	50
Hay (cut)	10	Hay (cut)	20		
Roots	20	Roots	40		
Straw (cut)	5	Straw (cut)	5	Straw (cut)	5
Oil-cake	2	Oil-cake	2	Oil-cake	2
Pease (ground)	2	Pease (ground)	2	Pease (ground)	2
Barley (ground)	2	Barley (ground)	2	Barley (ground)	2
	61		71		61

For the purpose of making a comparison of the relative cost of fattening steers upon the three different rations, a cash value was estimated for the component fodders in each. The hay was valued at $8 per ton; roots at $4 per ton; straw at $4 per ton; oil-cake at $30 per ton; pease and barley at $20 per ton; and corn ensilage at $2 per ton. The corn ensilage was valued at a higher figure than in the former experiment (in 1890–91) for the reason that the corn was wilted to a greater extent before it was put into the silos, and because it cost more in 1891 than in 1890 owing to the crop being damaged by a hail storm in August. The prices at which the several fodders are valued for the purposes of this comparison are higher than the cost of production to the ordinary farmer, and may be higher or lower than the prices which could be realized from their sale as fodders.

The following Table shows, (1) the increase in weight of each steer in 18 weeks' (2) the total quantity of feed consumed on the average per head per day, (3) the average quantity of the meal mixture (included in the former) consumed per head per day, and (4) the average cost per head per day, for feed consumed.

TABLE IV.

RATIONS.		Increase in weight.	Feed consumed per head.	Meal in feed per day.	Cost per head per day.
		lbs.	lbs.	lbs.	cents.
No. 1.	Hay, roots, corn ensilage and meal	152	61·96	6·09	18·28
	do do	265			
No. 2.	Hay, roots and meal	165	53·92	4·55	18·22
	do	213			
No. 3.	Corn ensilage and meal	260	67·92	6·68	14·47
	do	229			

THE FATTENING OF STEERS ON CORN ENSILAGE AND FROZEN WHEAT.

From December 1 until January 5, the other two steers were fed upon a ration composed of—

	Lbs.
Corn ensilage	50
Straw (cut)	5
	55

During that period, they gained in weight an average of 11 lbs. per head, and consumed on the average 61·9 lbs. of feed per head per day, at a cost of 6·75 cents per head per day.

From January 5 until April 5, these two steers were fed upon a ration composed of,

	Lbs.
Corn ensilage	50
Straw (cut)	5
Frozen wheat (ground)	6
	61

During that period of 13 weeks, they gained in weight an average of 159 lbs. per head, and consumed on the average 59·88 lbs. of feed per head per day, at a cost of 9·32 cents per head per day. The frozen wheat was valued at 35 cents per bushel.

Table V shows, (1) the average increase in weight per head per day, (2) the average cost per head per day for feed consumed, and (3) the average cost of feed consumed per 100 lbs. of increase in live weight.

TABLE V.

RATIONS.	Increase in weight per day.	Cost per head per day.	Cost per 100 lbs. increase in weight.
	lbs.	cents.	$
No. 1. Hay, roots, corn ensilage and meal	1.65	18·28	11 05
No. 2. Hay, roots and meal	1·50	18·22	12 14
No. 3. Corn ensilage and meal	1·94	14·47	7 45
No. 4. Corn ensilage and frozen wheat	1·74	9·32	5 33

Conclusions. From these tests it appears that:—

(1.) During the feeding period of 18 weeks, the steers which were fed upon ration No. 3 (corn ensilage and meal), gained in weight on the average 55½ lbs. per head more, and cost 3·75 cents per head less, per day for feed consumed, than the steers which were fed upon ration No. 2 (hay, roots and meal);

(2.) During the feeding period of 18 weeks, the steers which were fed upon ration No. 3 (corn ensilage and meal), gained in weight on the average 36 lbs. per head more, and cost 3·31 cents per head less, per day for feed consumed, than the steers which were fed upon ration No. 1 (hay, roots, corn ensilage and meal);

(3.) The cost for feed consumed per 100 lbs. of increase in live weight, was 62·95 per cent greater on ration No. 2 (hay, roots and meal), and 48·32 per cent greater on ration No. 1 (hay, roots, corn ensilage and meal) than it was on ration No. 3 (corn ensilage and meal);

(4.) On ration No. 2 (hay, roots and meal) the quantity of meal consumed per head per day, was 4·55 lbs. as against 6·68 lbs. per head per day on ration No. 3 (corn ensilage and meal);

(5.) The quality of the beef, from the steers fed upon corn ensilage and frozen wheat, was pronounced to be particularly excellent by the butchers, and by the members of eight different households who examined it critically when served as roast beef.

NOTE.—To furnish further data for a comparison between the bulky-fodder portions of rations Nos. 1, 2 and 3, an equal quantity of meal per head per day, will be fed to the several animals in our next series of experiments, instead of equal quantities of meal being added to the different rations.

THE FEEDING OF THREE-YEAR-OLD STEERS.

Four 3-year-old steers were purchased and were sorted into two lots of apparently even quality. On December 3, the operation of dehorning was performed on them. The wounds on the heads of three of the animals appeared to be acutely painful for about a week, and during that time they all lost from 40 to 100 lbs. each. The other animal did not seem to suffer much, after the operation of sawing off the horns was ended. After the wounds were healed, the animals were fed loose in a cold shed with only one thickness of lumber between them and the outside air.

The preparatory feeding period lasted from October 29 to December 1, and during it the animals were all fed upon the following ration:—

	Lbs.
Corn ensilage	25
Roots	50
Straw (cut)	15
Pease (ground)	3
Barley (ground)	3
	96

They were each allowed as much of the mixture as they would eat.

On October 29, the average weight per head was 1,182 lbs.; and on December 1, it was 1,251 lbs.,—showing a gain of 69 lbs. per head.

Two rations were composed as in Table VI.

TABLE VI.

Ration No. 3.	Lbs.	Ration No. 5.	Lbs.
Corn ensilage	50	Corn ensilage	50
Straw (cut)	5	Straw (cut)	5
Oil-cake	2		
Pease (ground)	2		
Barley (ground)	2		
	61		55

For the purpose of making a comparison, a cash value was estimated for each of the component fodders in each ration as mentioned after Table III, page 58.

The following Table shows, (1) the increase in weight of each steer in 18 weeks, (2) the quantity of feed consumed on the average per head per day, (3) the quantity of the meal mixture (included in the former) consumed per head per day, and (4) the average cost per head per day, for feed consumed.

TABLE VII.

RATIONS.		Increase in weight.	Feed consumed.	Meal in feed per day.	Cost per head per day.
		lbs.	lbs.	lbs.	lbs.
No. 3.	Corn ensilage and meal	102	65·96	6·48	14·05
	do do	155			
No. 5.	Corn ensilage	50	54·65	0	5·96
	do	7			

THE FEEDING OF ONE-YEAR-OLD STEERS.

Four 1-year-old steers were purchased and were sorted into two lots of apparently even quality.

The preparatory feeding period lasted from 29th October, to 1st December, and during it, the animals were all fed upon the following ration:—

	Lbs.
Corn ensilage	25
Roots	50
Straw (cut)	15
Pease (ground)	3
Barley (ground)	3
	96

They were each allowed as much of the mixture as they would eat.

On 29th October, the average weight per head was 751 lbs.; and on 1st December, it was 805 lbs.; showing a gain of 54 lbs, per head.

From 1st December until 5th April, both lots were fed upon ration No. 3:—

	Lbs.
Corn ensilage	50
Straw (cut)	5
Oil-cake	2
Pease (ground)	2
Barley (ground)	2
	61

The two steers of one lot, were fed loose in a cold shed with only one thickness of lumber between them and the outside air; and the two steers of the other lot, were fed tied in stalls in the cattle stable. The average temperature of the stable would be about 50° Fahr.

The following Table shows, (1) the increase in weight of each steer in 18 weeks, (2) the quantity of feed consumed on the average, per head per day, (3) the quantity of the meal mixture (included in the former), consumed per head per day, and (4) the average cost per head per day, for feed consumed.

TABLE VIII.

RATIONS.	How fed.	Increase in weight.	Feed consumed per head.	Meal in feed per head.	Cost per head per day.
		lbs.	lbs.	lbs.	cents.
Corn ensilage and meal	In stable.	173	45·25	4·45	9·64
do	do	163			
do	In shed	172	43·94	4·32	9·36
do	do	129			

Conclusion. From this single test, it is not evident that there was an appreciable difference in the increase in the weight of the steers, or in the quantity of feed consumed, which was due to the place or manner of feeding,—stable *v.* shed, and tied *v.* loose.

THE FEEDING OF CALF-STEERS.

Four calf-steers were put under test on rations Nos. 2 and 3. Each lot contained one steer, out of a grade Shorthorn cow by a Shorthorn bull, and one steer out of a "Quebec Jersey" or "French Canadian" cow. The breeding of the sire of the Quebec steers was not known to us.

The preparatory feeding period lasted from October 29 to December 1, and during it the animals were all fed upon the following ration:—

	Lbs.
Corn ensilage	25
Roots	50
Straw (cut)	15
Pease (ground)	3
Barley (ground)	3
	96

They were each allowed as much of the mixture as they would eat.

On October 29, the average weight per head was 465 lbs.; and on December 1, it was 526 lbs., showing a gain of 61 lbs. per head.

The two rations were composed as in Table IX.

TABLE IX.

Ration No. 2.	Lbs.	Ration No. 3.	Lbs.
Hay (cut)	20	Corn ensilage	50
Roots	40		
Straw (cut)	5	Straw (cut)	5
Oil-cake	2	Oil-cake	2
Pease (ground)	2	Pease (ground)	2
Barley (ground)	2	Barley (ground)	2
	71		61

For the purpose of making a comparison, a cash value was estimated for each of the component fodders in each ration, as mentioned after Table III, page 58.

The following Table shows, (1) the increase in weight of each steer in 18 weeks, (2) the quantity of feed consumed on the average per head per day, (3) the quantity of the meal mixture (included in the former) consumed per head per day, and (4) the average cost per head per day, for feed consumed.

TABLE X.

RATIONS.	Breed.	Increase in weight.	Feed consumed per head.	Meal in feed per head.	Cost per head per day.
		lbs.	lbs.	lbs.	cents.
No. 2 { Hay, roots and meal.	Shorthorn........	255	30·71	2·59	10·38
do	Quebec..........	164			
No. 3 { Corn ensilage and meal...	Shorthorn........	212			
do ...	Quebec..........	175	35·25	3·46	7·51

The following Tables have been arranged to show, (1) the relative rates of increase in weight, (2) the relative cost per head per day, and (3) the relative cost of feed consumed per 100 lbs. of increase in live weight, of the steers of Shorthorn and Quebec blood respectively.

TABLE XI.

—	Breed.	Weight Dec. 1.	Weight April 5.	Increase.
		Lbs.	Lbs.	Lbs.
Steer No. 174..........................	Shorthorn..............	595	850	255
do 173..........................	Quebec..................	480	644	164
do 172..........................	Shorthorn..............	600	812	212
do 171..........................	Quebec..................	430	605	175

TABLE XII.

RATIONS.	Breed.	Increase in weight per day.	Feed consumed per day.	Cost per head per day.	Cost per 100 lbs. of increase in weight.
		lbs.	lbs.	cents.	$
No. 2 } Hay, roots and meal.....	Shorthorn........	2·02	35·85	12·11	5·99
do	Quebec..........	1·30	25·65	8·67	6·66
No. 3 } Corn ensilage and meal..	Shorthorn........	1·68	39·00	8·31	4·94
do ...	Quebec..........	1·38	31·50	6·71	4 83

Conclusions. From these tests with calf steers it appears that:—

(1.) During the feeding period of 18 weeks, the steers which were fed upon ration No. 3 (corn ensilage and meal) GAINED in weight on the average 16 lbs. per head LESS, and cost 2.87 cents per head LESS per day for feed consumed, than the steers which were fed upon ration No. 2 (hay, roots and meal);

(2.) The *cost* of feed consumed per 100 lbs. of increase in live weight, was 27.6 *per cent greater*, on ration No. 2 (hay, roots and meal), than it was on ration No. 3 (corn ensilage and meal);

(3.) The *cost* of feed consumed per 100 lbs. of increase in weight was *lowest* in the case of a calf steer of "French Canadian" or "Quebec Jersey" breed, fed upon ration No. 3 (corn ensilage and meal).

COMPARISONS IN THE FEEDING OF STEERS OF DIFFERENT AGES.

In the foregoing Tables some information has been given showing the comparative quantities of feed consumed and the cost per 100 lbs. of increase in live weight, by 3-year-old steers, 2-year-old steers, 1-year-old-steers and calf-steers respectively, when fed upon the same ration.

The following additional Tables have been arranged to present a comparison of the results in convenient form. The lots which are compared were fed from Dec. 1 to April 5, upon ration No. 3, viz.:—

	Lbs.
Corn ensilage	50
Straw (cut)	5
Oil-cake	2
Pease (ground)	2
Barley (ground)	2
	61

TABLE XIII.

Steers.	Increase in weight.	Increase in weight per day per head.	Feed consumed per day per head.	Meal in feed per day per head.	Cost per head per day.	Cost per 100 lbs. of increase in weight.
	lbs.	lbs.	lbs.	lbs.	cents.	$
3-year-old, No. 189	102	1·02	65·96	6·48	14·05	13·77
do No. 188	155					
2-year-old, No. 183	260	1·94	67·92	6·68	14·47	7·45
do No. 182	229					
1-year-old, No. 178	173	1 33	45·25	4·45	9·64	7·23
do No. 177	163					
Calf steer, No. 172	212	1.53	35·25	3·46	7·51	4·89
do No. 171	175					

Conclusions. From this one series of experiments, it appears that :—

(1.) The *cost* for feed consumed per 100 lbs. of increase in live weight was *lowest* in the case of calf-steers, viz.: $4.89 per 100 lbs.;

(2.) The *cost* for feed consumed per 100 lbs. of increase in live weight was 84·83 *per cent greater* by the 3-year-old steers than by the 2-year-old steers;

(3.) The original weight of the 2-year-old steers was enhanced *in value per lb.*, quite as much by the feeding for 18 weeks, as was the original weight of the 3-year-old steers;

(4.) The original weight of the 1-year-old steers and calf-steers was not enhanced *in value per lb.* to any appreciable extent by the feeding for 18 weeks.

NOTES.—The 1-year-old steers and calf-steers have been carried over to be fed during the winter of 1892-93.

The corn ensilage, which was used in these experiments, was made from several varieties of Indian corn, most of which had not reached the early milk stage of growth. By the planting of varieties of corn which ripen early (mainly Longfellow and Pearce's Prolific) a quality of ensilage which appears to be much superior, has been provided for the feeding experiments of 1892-93.

PART II.—THE FATTENING OF SWINE.

Experiments in the feeding of swine were commenced at the Central Experimental Farm in December, 1890. Particulars of the different sorts of feed, of the quantities of feed consumed, and of the increase in the live weight of the animals under the tests, were given in the Annual Report for 1891.

The objects of these first investigations were,—(1) to discover the difference, if any, in the quantity of grain required to produce every pound of increase in the live weight of the swine, when it was fed steamed and warm, and when it was fed raw

and cold, (2) to obtain a record of the comparative quantities of grain required to produce every pound of increase in the live weight of swine during different stages of the fattening period.

The mixture of grain used in the tests was one composed of equal parts of pease, barley and rye, which had been ground. It was saturated with water and fed wet in all cases.

Cold water was given to drink, and a mixture of salt and wood ashes was put in a box on the floor of every pen, where the pigs had access to it at will.

The quantities of feed consumed were weighed every day, and the swine were weighed once every week.

The following Table shows the quantities of feed consumed per pound of increase in live weight, during six feeding periods in four pens.

TABLE I.

—	PEN 1. 4 Swine, fed steamed and warm.	PEN 2. 4 Swine, fed raw and cold.	PEN 5. 4 Swine, fed steamed and warm, plus Sugar Beets.		PEN 6. 4 Swine, fed raw and cold, plus Sugar Beets.	
	Grain.	Grain.	Grain	Sugar Beets	Grain	Sugar Beets
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
December 9 to January 5	3 31	3·30	4·69	0·61	3·17	0·84
January 5 to February 2	3·07	3·07	2·46	2·00	2·76	2·23
February 2 to March 2	3·79	4·43	3·46	2·00	3·81	2·32
March 2 to March 30	5·00	7·07	5·40	3·63	3·15	2·13
March 30 to April 27	7·06	5·68	4·88	4·08	9·51	8·25
April 27 to May 18	8·53	5·71	4·17	3·31	6.58	6·C0
Average	4·16	4·25	3·86	+2·46	3·89	+2·73

Conclusions. These two sets of experiments indicate that:—

(1.) There is no appreciable difference in the number of pounds of grain required to produce a pound of increase in the live weight of swine, when it is fed steamed and warm, as compared with it when fed raw and cold;

(2.) On the average there is a gradual and great increase in the quantity of grain consumed for every pound of increase in the live weight of swine, after the second month of the fattening period, and after the average live weight exceeds 100 lbs.;

(3.) It is economical to market swine to be slaughtered when they weigh from 180 to 200 lbs., live weight;

(4.) The consumption of feed per day is *greatest* at or near the period of their fattening, when the quantity of feed consumed per pound of increase in weight, is *smallest.*

It may be added that to produce an increase of 3,231½ lbs. in the live weight of 24 swine, 4·14 lbs. of a mixture of equal parts of ground pease, barley and rye were required for every pound of increase in the live weight.

EXPERIMENTS IN FEEDING GRAIN, UNGROUND, GROUND AND WITH SKIM-MILK.

During the winter of 1891–2 experiments were begun to discover the effect of feeding swine upon a ration of grain only (unground and ground) as compared with a ration composed of grain and skim-milk. For the purpose, four pens of pigs were selected and sorted into lots as nearly alike as they could be obtained. In each of the four pens were put two pigs out of a Poland-China sow by an improved Large Yorkshire boar. With them were put three grade pigs in each of the three first pens; and in the fourth pen two pigs out of a Berkshire sow by an Improved Large Yorkshire boar, were put with the two cross-bred Poland-China-by-Yorkshire pigs.

The 9 grade pigs which were put in the first three pens with the 6 cross-bred Poland-China-by-Yorkshire pigs, were purchased outside. Their breeding was not known, but they appeared to be grades of Chester White, or Yorkshire blood. The pigs in the several pens, considered as lots, were as nearly as practicable equal as to breeding, quality, age and size.

The experiment began on January 4th and ended on May 2nd. The feed consumed was weighed every day, and the swine were weighed once every week. The following Tables have been arranged to show the average results at four different times in the fattening period.

Table II.

Pen 1 contained 5 swine, as described above—3 grades and 2 cross bred Poland-China-by-Yorkshire. They were fed upon a mixture of equal parts of pease, barley and rye, *not ground*, and soaked in cold water for 48 hours.

——	Jan. 4.	Feb. 1.	Feb. 29.	Mar. 28.	May 2.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight	346	386	502	646	780	....
Increase in weight	....	40	116	144	134	434
Feed consumed	....	378	490	544	538	1,930
do per lb. of increase in live weight	....	9·49	4·13	3·77	4·01	4·45

Table III.

Pen 2 contained 5 swine similar to those in Pen 1. They were fed upon a mixture of equal parts of pease, barley and rye, *ground* and soaked in cold water for 12 hours.

——	Jan. 4.	Feb. 1.	Feb. 29.	Mar. 28.	May 2.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight	346	430	580	741	865	....
Increase in weight	....	84	150	161	124	519
Feed consumed	....	461	572	657	576	2,266
do per lb. of increase in live weight	....	5·48	3·81	4·08	4·64	4·36

Table IV.

Pen 3 contained 5 swine similar to those in Pens 1 and 2. They were fed upon an allowance of the same mixture as those in Pen 2 (viz.: equal parts of pease, barley and rye, *ground* and soaked in cold water for 12 hours), plus all the skim-milk they would drink.

—	Jan. 4.	Feb. 1.	Feb. 29.	Mar. 28.	May 2.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight	346	434	590	768	1,017	....
Increase in weight	....	88	156	178	249	671
Feed consumed. Meal	....	230	286	432	704	1,652
+ Milk	....	1,081	2,078	2,649	3,537	9,345
do per lb. of increase in live weight. Meal	....	2·61	1·83	2·42	2·82	2·46
+ Milk	....	12·28	13·32	14·88	14·20	13·92

Table V.

Pen 4 contained 4 swine, 2 crossbred Poland-China-by-Yorkshire, and 2 crossbred Berkshire-by-Yorkshire. They were fed upon an allowance of the same mixture as those in Pens 2 and 3, (viz., equal parts of pease, barley and rye, *ground* and soaked for 12 hours), plus all the skim-milk they would drink.

—	Jan. 4.	Feb. 1.	Feb. 29.	Mar. 28.	May 2.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight	306	395	520	675	842	....
Increase in weight	....	89	125	155	167	536
Feed consumed. Meal	....	332	385	514	626	1,857
+ Milk	....	610	481	551	938	2,580
do per lb. of increase in live weight. Meal	....	3·73	3·07	3·31	3·74	3·46
+ Milk	....	6·85	3·84	3·54	5·61	4·81

Conclusions. From these tests which continued 17 weeks, it appears that:—

(1.) 4·45 lbs. of grain were consumed per lb. of increase in live weight, when it was fed *unground* and soaked for 48 hours;

(2.) 4·36 lbs. of grain were consumed per lb. of increase in live weight, when it was fed *ground* and soaked for 12 hours;

(3.) 1 lb. of grain was the equivalent of 6·65 lbs. of skim-milk in increasing the live weight;

(4.) The swine, which were fed upon a ration containing skim-milk, were lustier and more robust in appearance, than those which were fed upon grain only.

EXPERIMENTS IN FEEDING FROZEN WHEAT.

The first test in this series was undertaken to discover, (1) what results could be obtained from the fattening of large-sized swine upon a ration of frozen wheat, and, (2) how frozen wheat compared with a mixture of equal parts by weight of pease, barley and wheat for increasing the live weight of the animals.

Twelve grade swine were purchased; their age and breeding were not known. The average weight at the commencement of the test was 186 lbs. each. They were sorted into three lots, which were nearly even as to weight, quality and appearance.

The frozen wheat was procured from the branch Experimental Farms at Brandon, Man., and Indian Head, N.W.T. It was graded "No. 2 frozen," "No. 3 frozen," and "unmarketable."

TABLE VI.

Pen 1 contained 4 swine. They were fed upon frozen wheat *ground* and soaked in cold water for 12 hours.

—	Dec. 28.	Jan. 25.	Feb. 22.	Mar. 14.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight	739	847	969	1,100	....
Increase in weight	....	108	122	131	361
Feed consumed	....	701	650	565	1,916
do per lb. of increase in live weight	....	6·49	5.33	4·28	5.30

TABLE VII.

Pen 2 contained 4 swine. They were fed upon frozen wheat, *unground* and soaked for an average of 42 hours. (During the first 2 weeks of the test, the wheat was soaked for only 12 hours; that may account for the unusually large quantity consumed per lb. of increase in weight).

—	Dec. 28.	Jan. 25.	Feb. 22.	Mar. 14.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight	745	784	958	1,091	....
Increase in weight	....	39	174	133	346
Feed consumed	....	697	945	640	2,282
do per lb. increase in live weight	....	17·87	5·42	4·81	6·59

TABLE VIII.

Pen 3 contained 4 swine. They were fed upon a mixture of equal parts by weight of wheat, barley and pease, *unground* and soaked for an average ef 42 hours.

—	Dec. 28.	Jan. 25.	Feb. 22.	Mar. 14.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight	747	816	963	1,114	....
Increase in weight	....	69	147	151	367
Feed consumed	....	673	935	620	2,228
do per lb. of increase in live weight	....	9·75	6·36	4·10	6·07

Conclusions. From these tests with heavy swine, it appears that:—

(1.) when the frozen wheat was fed, *ground* and soaked for 12 hours, 11·3 lbs. of increase in the live weight were obtained per bushel of wheat;

(2.) When the frozen wheat was fed *unground* and soaked for 12 and 42 hours, 9·1 lbs. of increase in the live weight were obtained per bushel of wheat;

(3.) When the frozen wheat is to be fed *unground*, it should be soaked for at least 42 hours;

(4.) Leaving out of the reckoning, the weeks during which the frozen wheat *unground*, and the mixture of wheat, barley and pease *unground*, were soaked for only 12 hours, 5·24 lbs. of frozen wheat were consumed per lb increase, and 5·22 lbs. of the mixture of wheat, barley and pease were consumed per lb. of increase in the live weight.

The second test in this series was made with younger and smaller swine to discover, (1) the quantity of frozen wheat consumed per lb. of increase in live weight, and (2) the quantity of skim-milk which would be the equivalent of a pound of frozen wheat in increasing the live weight of the swine.

TABLE IX.

Pen V contained 5 swine bred at the Experimental Farm; they were out of a Poland-China sow by an Improved Large Yorkshire boar. They were fed upon frozen wheat *ground* and soaked for 12 hours. During the last 3 weeks of the test, they were fed upon the lowest quality of frozen wheat only, which has been graded "unmarketable."

—	Feb. 1.	Feb. 29.	Mar. 28.	May. 2.	May 30.	Totals.
	Lbs.	lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight	306	470	595	724	827	....
Increase in weight	....	164	125	129	103	521
Feed consumed	....	565	508	551	580	2,204
do per lb. of increase in live weight	....	3·44	4·06	4·27	5·63	4·23

TABLE X.

Pen VI contained 4 swine bred at the Experimental Farm; they were out of a grade Berkshire sow by an Improved Large Yorkshire boar. They were fed upon an allowance of frozen wheat, *ground* and soaked for 12 hours, plus as much skim-milk as they would drink.

—	May 2.	May 31.	June 27.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.
Live weight	415	519	*577	....
Increase in weight	....	104	141	245
Feed consumed { Wheat +	....	327	322	649
Feed consumed { Milk	....	1,601	1,465	3,066
do per lb. of increase in live weight { Wheat +	....	3·14	2·28	2·65
do per lb. of increase in live weight { Milk	....	15·39	10·39	12·51

* 3 swine only.

Conclusions. From these tests with swine weighing an average of 61 lbs. each in the one pen, and an average of 104 lbs. each in the other pen, it appears that:—

(1.) When the frozen wheat was fed *ground* and soaked for 12 hours, 14·18 lbs. of increase in the live weight were obtained. per bushel of wheat;

(2.) In the feeding of swine from an average weight of 61 lbs. each, until they reached an average weight of 145 lbs. each, 15·46 lbs. of increase in the live weight were obtained, per bushel of wheat;

(3.) 1 lb. of frozen wheat was the equivalent of 7-91 lbs. of skim-milk in increasing the live weight;

(4.) The swine which were fed upon a ration containing skim-milk were lustier and more robust in appearance, than those which were fed upon grain only.

The swine from Pens V and VI were slaughtered; and the hams, sides and shoulders were cured in pickle by an Ottawa pork-dealer and ham-curer. The bacon and hams were pronounced excellent in quality, by many who examined them and afterwards purchased them for their own tables.

The parts of one side, from a pig of the lot which were fattened upon frozen wheat exclusively, were sent for opinion to Wm. Davies, Esq., of the Wm. Davies Co., Limited, Toronto, who have one of the largest and best known establishments for the curing of swine products in Canada. The following is the sum of the verdict of Mr. Davies upon its quality:—

"It is excellent, rather too salt, but very rich and luscious. I consider it superior to hogs fed on peas alone. The complaint regarding pea-fed bacon in England, is that the lean is hard, and this is the case to some extent with the fat also. It would be well if farmers in Canada would mix the grain and grind it, then give it to the hogs with whey, butter-milk or skim-milk."

GENERAL REMARKS.

In those parts of Canada, where a less or greater quantity of wheat may be injured by frost or other climatic conditions, the farmers should fortify their positions by providing means whereby to market, in the best way, this product which cannot be sold at paying prices in the form of grain. From 9·1 lbs. to 15·46 lbs. of increase in the live weight of swine have been obtained per bushel of frozen wheat consumed.

When swine are fetching 5 cents per lb. live weight, with an allowance of five per cent deducted for shrinkage, the frozen wheat fed under the least favourable of ordinary conditions, may realize 43¼ cents per bushel. At the same price for swine, the frozen wheat, fed under favourable conditions in the quality and age of the swine and the preparation of the feed, may realize 73·45 cents per bushel.

The conditions required for the profitable feeding of swine are (1) clean, dry, warm quarters protected from wind and draughts, (2) as much wholesome feed—if grain preferably *ground* fine—as they will eat clean, three times a day, and (3) free access to a mixture of salt and ashes, to sods, or to soil.

To meet the requirements of foreign markets, swine with lean meat are wanted; larger numbers of them should be fed and fattened during the summer months; and they should be sold alive by the farmer or feeder in order that they may be slaughtered at packing houses, where the carcases can be cut and cured in a uniformly satisfactory manner, suited to the preferences of different buyers.

PART III.—EXPERIMENTAL DAIRY WORK.

In the Experimental Dairy, the experiments which have been carried on far enough to be reported upon are:—

I. Experiments in the creaming of milk during every month of the year (1) by a centrifugal cream separator; (2) by the gravity or setting method in the use of deep setting pails in ice water; and (3) by the gravity or setting method in the use of shallow milk-pans;

II. Experiments in the creaming of milk and the making of butter from the milk of cows (1) which had been milking for periods exceeding 6½ months each, and (2) which had been milking for periods of less than 6½ months each;

III. Experiments in churning sweet cream at different temperatures;

IV. Experiments in the churning of cream after the addition to it of different percentages of water.

I—*Experiments in the Creaming of Milk.*

A series of experiments was undertaken to obtain information upon the relative efficiency of three different methods of creaming milk, for every month of the year. The methods used were (1) an Alexandra centrifugal cream separator; (2) deep-setting shot-gun milk pails set in ice water, and (3) shallow milk-pans set on a table in a room of which the temperature was recorded. The milking cows in our herd comprised Shorthorns, Ayrshires, Holsteins, Jerseys, Devons, Quebec Jerseys, and Shorthorn grade cows. Fresh-calved cows came in from time to time during the year. Mixed milk from the herd was used in the tests; and the testing by each of the three methods lasted for a period of one week of every month.

The following Table shows the results which were obtained by the use of a No. 4 Alexandra cream separator, No. 8 size, during one week of every month.

TABLE I.

—	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Temperature of milk.. Fahr.	98°	98°	98°	98°	95°	95°	98°	98°	98°	98°	98	98°
Speed of separator.... per minute	7,000	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,500	7,500	7,200
Milk per hour..... lbs.	500	400	400	450	500	500	550	500	500	450	500	425
Fat in milk...per cent.	3·93	3·88	3·66	3·73	3·70	3·76	3·50	3·40	3·50	3·52	3·55	3·90
Fat in skim-milk...... per cent.	0·30	0·08	0·10	0·04	0·08	0·08	0·04	0·04	0·03	0·08	0·05	0·04
Fat in butter-milk .... per cent.	0·15	0.10	0·40	0·20	0·25	0·15	0·20	0·15	0·10	0·13	0·07	0·30
Milk per lb. of butter.. lbs.	23·89	22·78	24·45	23·44	23·31	23·09	25·48	25·46	25·46	24·94	24·40	22·06
Butter per 100 lbs. of milk .... lbs.	4·19	4·39	4·09	4·27	4·29	4·33	3·92	3·93	3·93	4·01	4·10	4·55
Butter per 100 lbs. of fat in milk.... .....lbs.	106·60	113·02	111·75	114·37	115·93	115·18	112·13	115·54	112·20	113·88	115·43	116·22
Fat in butter..per cent.	87·53	86·76	86·31	86·19	85·63	84.99	87·85	85·33	88·20	85·80	85·42	84·61
Fat not recovered..... per cent.	6·69	1·94	3·55	1·43	2·50	2·11	1.50	1.41	1·04	2·29	1·40	1·66

The following Table shows the results which were obtained by setting the milk during one week of every month in shot-gun milk-pails in a tank of ice water. The pails were of the ordinary cylindrical shape and size, viz., 20 ins. by 8½ ins. The skimming was effected by the use of a cone-shaped skimmer; and enough of the skim milk was removed with the cream to ensure a complete recovery of the butter fat which had risen to the top. The milk in every case was set immediately after it was received from the stable and it was left for 22 hours in the ice water.

TABLE II.

—	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Temperature of milk, when set.. .. Fahr.	88°	86°	89°	90°	93°	95°	95°	96°	84°	84°	82°	80°
Temperature of water.. Fahr.	38°	38°	38°	38°	38°	38°	38°	38°	36°	35°	36°	37°
Temperature of milk, when skimmed. Fahr.	38°	38°	38°	38°	38°	38°	38°	38°	36°	35°	36°	37°
Fat in milk... per cent.	3·95	3·81	3·68	3·72	3.70	3·76	3·50	3.40	3·50	3·52	3·55	3·90
Fat in skim-milk ..... per cent.	0·92	0·69	0·51	0·41	0·35	0·45	0·23	0·23	0·35	0·39	0·80	0·87
Fat in butter-milk .... per cent.	0·20	0·35	0·39	0·20	0.20	0·15	0·20	0·30	0·20	0 30	0·20	0·25
Milk per lb. of butter. lbs.	26·51	25·98	26·17	25·77	24.85	25·30	26·49	26·41	25.77	25·94	28·46	25·64
Butter per 100 lbs. of milk.. .... lbs.	3·77	3·85	3·82	3·88	4·02	3·95	3·77	3·79	3·88	3·85	3·51	3·90
Butter per 100 lbs. of fat in milk.... lbs.	95·48	101·01	103·83	104·35	108·75	105·11	107.84	111·39	110·86	109.57	99·03	100·00
Fat in butter.. per cent.	84·42	83·27	83·90	86 41	84·14	85·42	87·01	83·73	82·28	81·99	82·35	81·79
Fat not recovered...... per cent.	19·39	15·88	12·34	9·76	8·49	10·22	6·16	6·74	8·79	10·16	18·44	18·20

The following Table shows the results which were obtained by setting the milk, during one week of every month, in shallow milk-pans. The pans were twelve inches in diameter and the milk was set in them to a depth of three inches. In every case, the milk was set immediately after it was received from the stable; and it was left for 22 hours before it was skimmed.

TABLE III.

—	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Temperature of milk, when set.......Fahr.	88°	86°	89°	90°	93°	95°	95°	96°	84°	84°	82°	80°
Temperature of room.. Fahr.	60°	60°	58°	55°	60°	70°	72°	65°	45°	45°	48°	50°
Temperature of milk, when skimmed. Fahr.	60°	60°	60°	56°	60°	70°	73°	66°	45°	45°	48°	50°
Fat in milk... per cent.	3·98	3·81	3·68	3·72	3·70	3·76	3·50	3·40	3·50	3·52	3·55	3·90
Fat in skim-milk . ... per cent.	0·72	0·53	0·40	0·58	0·48	0·41	0·32	0·40	0·45	0·47	0·50	0·55
Fat in butter-milk .... per cent.	0·30	0·35	0·35	0·20	0·15	0·15	0·20	0·15	0·20	0·30	0·15	0·20
Milk per lb. of butter.. lbs.	25·00	25 05	25·00	27·05	25·46	25·00	25·69	26·53	27·38	27·16	26·92	24·39
Butter per 100 lbs. of milk........... lbs.	4·00	3·99	4·00	3·70	3·93	4·00	3·89	3·77	3·65	3·68	3·71	4·1
Butter per 100 lbs. of fat in milk .... .lbs.	100·50	104·76	108·70	99·35	106·17	106·40	111·28	110·86	104·36	104·71	104·67	105·13
Fat in butter.. per cent.	83·75	83·30	82·50	86 82	83·50	84·82	82·31	80·76	85·24	84·04	84·15	83·61
Fat not recovered...... per cent.	15·70	12·73	10·33	13·74	11·35	9·74	8·41	10·46	11·04	12·00	11·92	12·10

The percentages of butter-fat in the mixed herd milk were practically the same for the three several weeks of every month; the greatest difference being in January, when it was ·05 of one per cent of fat.

The following charts have been prepared to show at a glance, the comparative results which were obtained from the three different methods.

CHART I.

NUMBER of pounds of Butter obtained per 100 pounds of Milk, from the three different methods of creaming, as per Tables I., II. and III.

Centrifugal cream separator, ————
Deep-setting milk-pails, ————
Shallow milk-pans, ...

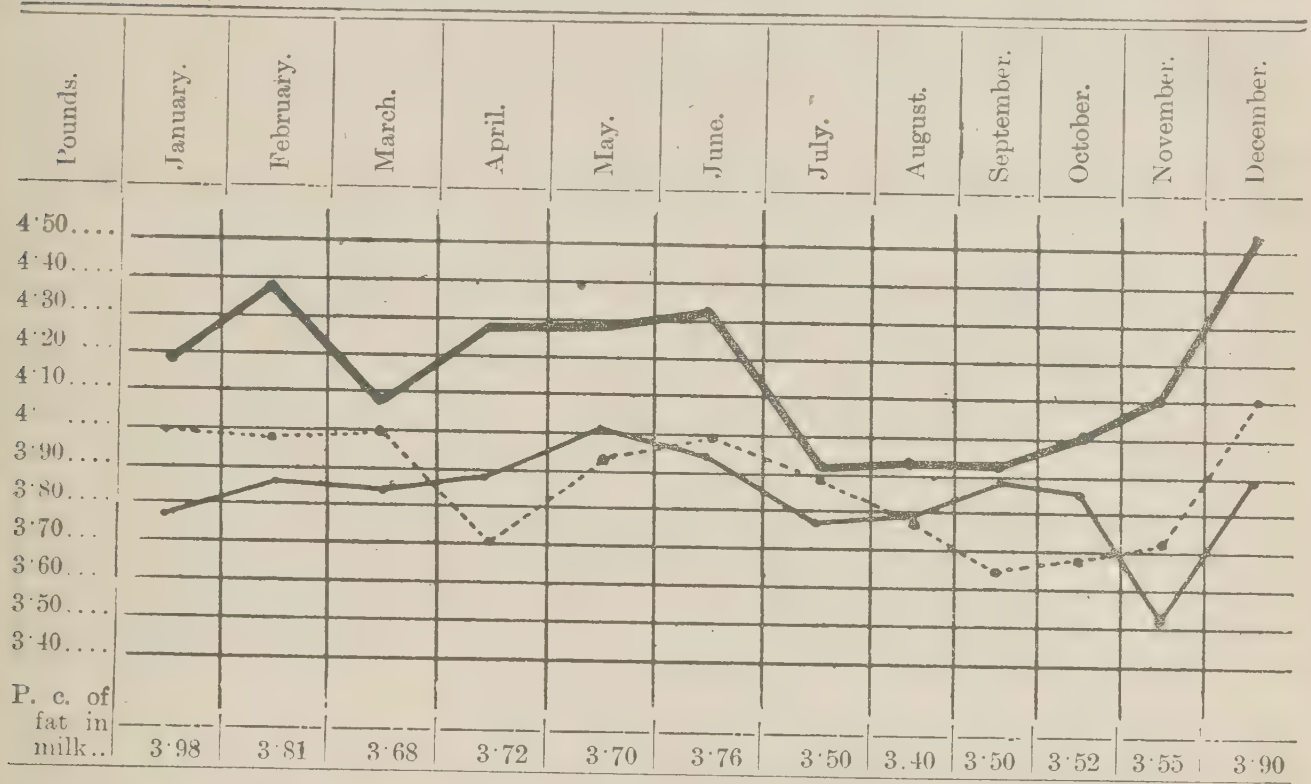


CHART II.

PERCENTAGE of Fat in Skim-milk, from the three different methods of creaming, as per Tables I., II. and III.

Centrifugal cream separator, ————
Deep-setting milk-pails, ————
Shallow milk-pans, ...

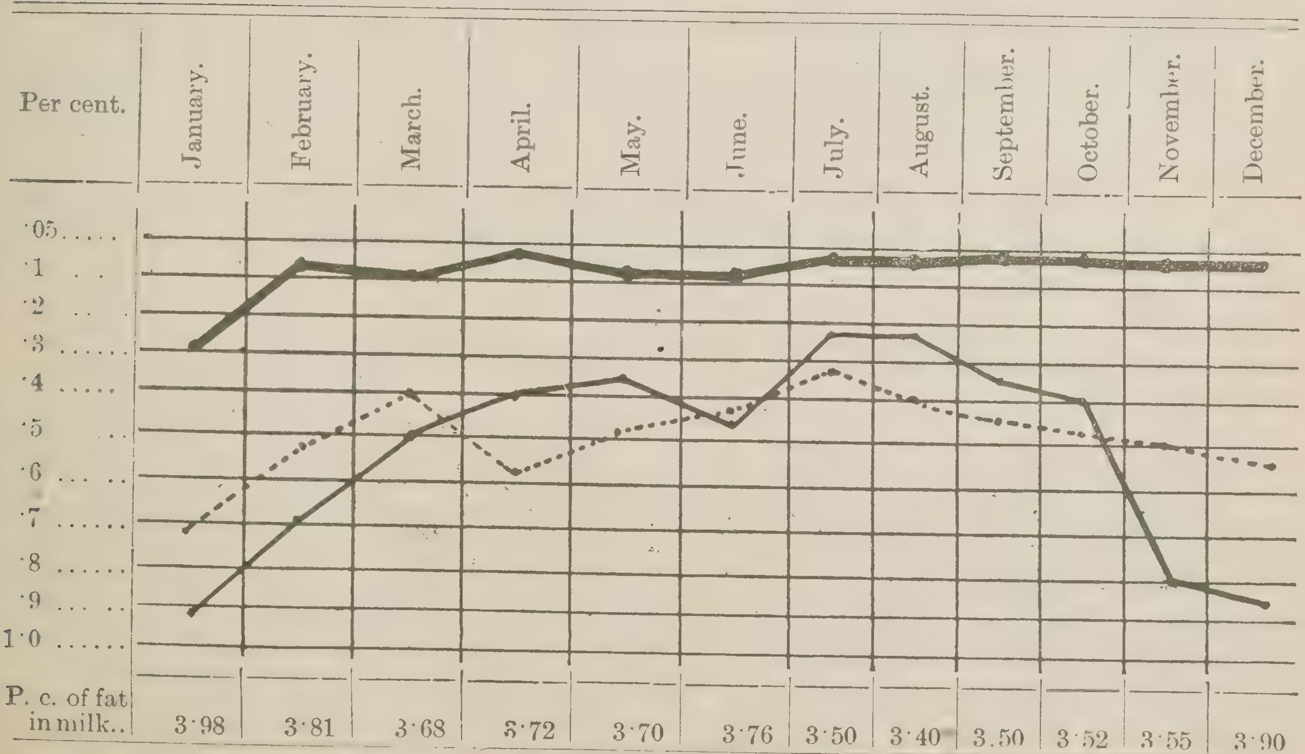
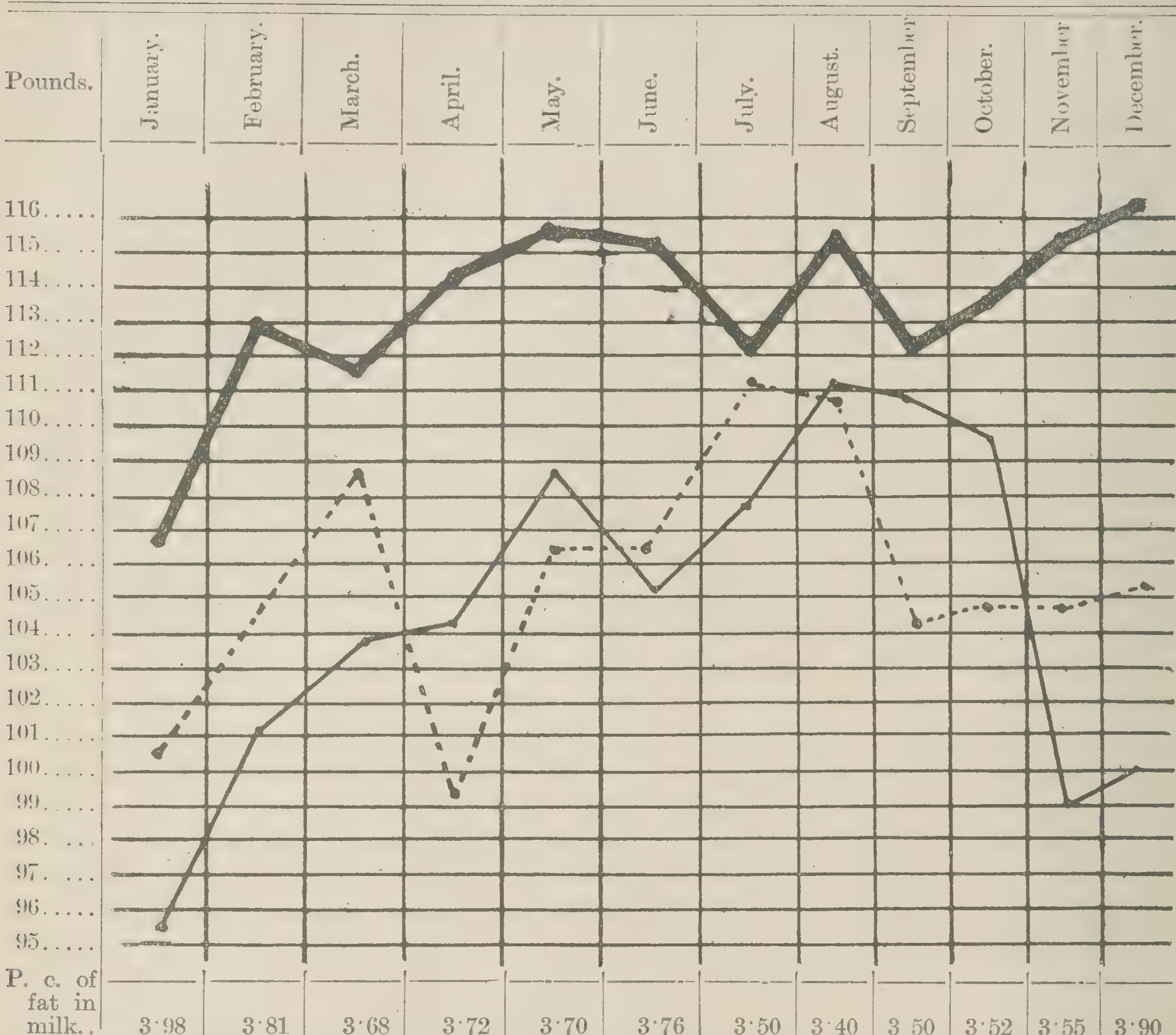


Chart III.

Number of pounds of marketable Butter, obtained per 100 pounds of Butter fat in milk, from the three different methods of creaming, as per Tables I., II. and III.

Centrifugal cream separator,
Deep-setting milk-pails,
Shallow milk-pans,



(II) Experiments in the creaming of Milk and the making of Butter from the Milk of Cows, (1) which had been milking for periods exceeding $6\frac{1}{2}$ months each, and (2) which had been milking for periods of less than $6\frac{1}{2}$ months each.

The following Table shows the results on the average, from 4 tests in each case, when the creaming was effected by the centrifugal cream separator.

Table IV.

—		From Cows milking more than $6\frac{1}{2}$ months each.	From Cows milking less than $6\frac{1}{2}$ months each.
Temperature of milk	Fahr.	98°	98°
Speed of separator	per min.	7,400	7,400
Milk per hour	lbs.	450	500
Fat in milk	per cent.	3·68	3·18
Fat in skim-milk	"	·20	·02
Fat in butter-milk	"	·05	·06
Butter per 100 lbs. of fat in milk	lbs.	115·06	120·48
Fat not recovered	per cent.	4·23	·72
Butter score for flavour out of possible 40 points	at 1 week	37	39
	at 14 weeks	28	35

Conclusions. The results from these 4 tests indicate that:—

(1.) From the milk of cows, which had been milking for periods exceeding $6\frac{1}{2}$ months each, 3·51 per cent more of the butter-fat was not recovered, even when the rate of inflow of the milk into the centrifugal cream separator was 10 per cent less than in the case of the milk from cows which had been milking for periods of less than $6\frac{1}{2}$ months each;

(2.) The butter from the milk of the cows which had been milking for the longer periods, was not as good in the flavour and did not keep so well as the butter from the milk of the cows which had been milking for the shorter periods.

The following Table shows the results, on the average from 7 tests in each case, when the creaming was effected by the deep-setting milk-pails, set in ice water for a period of 22 hours.

TABLE V.

—		From Cows milking more than $6\frac{1}{2}$ months each.	From Cows milking less than $6\frac{1}{2}$ months each.
Temperature of milk when set	Fahr.	85°	86°
Temperature of water	"	38°	38°
Temperature of milk when skimmed	"	38°	38°
Fat in milk	per cent.	3·67	3·56
Fat in skim-milk	"	1·43	·21
Fat in butter-milk	"	·40	·35
Butter per 100 lbs of fat in milk	lbs.	80·91	114·85
Fat not recovered	per cent.	32·55	6·34
Butter score for flavour out of possible 40 points	at 4 weeks	33	35

Conclusions. The results from these tests indicate that:—

(1.) From the milk of cows which had been milking for periods exceeding $6\frac{1}{2}$ months each, 26·21 per cent more of the butter-fat was not recovered, than from the milk of cows which had been milking for periods of less than $6\frac{1}{2}$ months each;

(2.) The butter from the cows which had been milking for the longer periods was not as good in the flavour as the butter from the milk of the cows which had been milking for the shorter periods.

The following Table shows the results, on the average from 8 tests in each case, when the milk of one fresh-calved cow was mixed with the milk of the cows which had been milking for periods exceeding $6\frac{1}{2}$ months each, and when the creaming was effected by the deep-setting milk-pails, set in ice water for a period of 22 hours.

TABLE VI.

—		From Cows milking more than $6\frac{1}{2}$ months each	From Cows milking less than $6\frac{1}{2}$ months each
Temperature of milk when set	Fahr.	85°	85°
Temperature of water	"	38°	38°
Temperature of milk when skimmed	"	38°	38°
Fat in milk	per cent.	3·58	3·54
Fat in skim-milk	"	·55	·23
Fat in butter-milk	"	·40	·32
Butter per 100 lbs. of fat in milk	lbs.	103·29	114·94
Fat not recovered	per cent.	14·00	6·71
Butter score of flavour out of possible 40 points	at 5 weeks.	36	38

Conclusions. The results from these 8 tests indicate that:—

(1.) When the milk of one fresh-calved cow was added to the milk from eight cows, which had been milking for periods sxceeding 6½ months each, 7·29 per cent more of the butter-fat was not recovered, than from the milk of cows which had been milking for periods of less than 6½ months each;

(2.) The addition of the milk of one fresh-calved cow to the milk from eight cows which had been milking for periods exceeding 6½ months each, resulted in the recovery of 18·55 per cent more of the butter-fat, than from the milk of the same cows when set in deep-setting milk-pails, without the addition of the milk from a fresh-calved cow.

(III.) *Experiments in churning Sweet Cream at different Temperatures.*

During the month of March a number of tests were conducted to ascertain the temperature at which the churning of sweet cream would give the most efficient recovery of the butter-fat. In a No. 5 Daisy revolving barrel churn, of a capacity of fourteen gallons, 16 tests were made as shown in Table VII.

TABLE VII.

Number of Tests made.	2	6	6	1	1
Quantity of cream, ... lbs.	42	36	38·5	40	23
Temperature when churning was started ... Fahr.	41°	46°	45°	48°	55°
do do finished ... "	58°	58°	59°·5	58°	58°
Increase in temperature ... "	17°	12°	14°·5	10°	3°
Period of churning ... min.	90	75	85	40	10
Speed of churn ... rev. per min.	70	70	68	72	74
Fat in butter-milk ... per cent.	0·10	0·20	0·25	0·25	0·60

In a No. 2 Daisy revolving barrel churn of a capacity of three gallons, 26 tests were made as shown in Table VIII.

TABLE VIII.

Number of Tests made.	9	12	2	1	1	1
Quantity of cream ... lbs.	20	12	25·5	19	30	15
Temperature when churning was started ... Fahr.	42°	44°	50°	52°	57°	58°
do do finished ... "	60°	57°	59°	58°	61°	62°
Increase in temperature ... "	18°	13°	9°	6°	4°	4°
Period of churning ... min.	113	95	90	50	70	50
Speed of churn ... rev. per min.	68	68	71	65	68	70
Fat in butter-milk ... per cent.	0·15	0.20	0·15	0·30	0·50	0·40

Conclusions. The results from these 42 tests indicate that:—

(1.) When the churning of sweet cream is started at a temperature of 50° Fahr., or under, the quantity of butter-fat remaining in the butter-milk need not exceed 0·25 of 1 per cent;

(2.) For the efficient recovery of the butter-fat by the churning of sweet cream, the temperature of the cream should not be above 50° Fahr., when the churning is started; and the churn (if a revolving one) should not be filled to more than one quarter of its actual holding capacity.

(IV.) *Experiments in the churning of Cream after the addition to it of different percentages of Water.*

Four series of tests were made to compare the results from the churning of cream with and without the addition of different percentages of water to the cream, before it was ripened. These tests were conducted at intervals from May 6th to October 1st. The cream was obtained from mixed herd milk (containing on the average 3·45 per cent of butter-fat) by means of a centrifugal cream separator, which separated 14 per cent of the whole milk as cream. The cream, in each test of the four series, was divided into two equal portions. The one portion was ripened to the usual degree of sourness or was kept sweet, and was churned as normal cream; a percentage of water (from 10 to 30 per cent) was added to the other portion in each test, after which it was churned in the same manner as the normal cream.

The following Table shows the results which were obtained, on the average, from the tests of the different series.

TABLE IX.

	Series 1.		Series 2.		Series 3.		Series 4.	
Number of tests made.	5		4		4		5	
	Normal Cream.	10 per cent of water added.	Normal Cream.	20 per cent of water added.	Normal Cream.	25 per cent of water added.	Normal Cream.	30 per cent of water added.
Milk per lb. of butter...... lbs.	25·77	26·11	24·83	25·20	25·17	25·45	25·14	25·74
Butter per 100 lbs. of milk. "	3·88	3·83	4·03	3·97	3·97	3·93	3·98	3·88
Butter per 100 lbs. of fat in milk.... .... "	115·23	113·76	116·58	114·84	113 50	112·27	115·03	112·34
Fat not recovered....... per cent.	2·32	2·37	1·83	1·83	2·41	2·61	3·20	3·12

The following Table shows the results, on the average from the 18 tests, with normal cream and the results, on the average from the 18 tests, with cream to which water had been added—(from 10 to 30 per cent as per Table IX).

TABLE X.

——	Normal Cream.	Watered Cream.
Milk per lb. of butter.. lbs.	25·22	25·62
Butter per 100 lbs. of milk..... .... "	3·96	3·90
Butter per 100 lbs. of fat in milk.. .. "	115·08	113·30
Fat not recovered...... ....per cent.	2·44	2·48

An examination was made of the quality of the butter obtained. The butter from the watered cream was not so solid or firm in the grain as the butter from the normal cream; there was no appreciable difference in the flavour.

The churning period in every case was longer with the watered cream than with the normal cream. The additional time which was required for churning the watered cream bore no definite ratio to the percentage of water which had been added to the cream. The extra time was from 1 minute to 30 minutes.

Conclusions. When water was added to the cream in these 18 tests from May to October, the results indicate that:—

(1.) The churning was slightly less efficient in the recovery of the butter fat;

(2.) The quantity of marketable butter obtained per 100 lbs. of milk was slightly less (·06 lb.);
(3.) The butter was not so firm or solid in the grain;
(4.) The churning period, at an equal temperature, was longer by from 1 minute to 30 minutes.

PART IV.—FORTY-ACRE LOT.

In the spring of 1891, a portion of the farm, measuring about forty acres, was set apart for the particular purpose of growing forage crops for cattle, in order to ascertain and illustrate how many cattle might be fed for the whole year upon the products of that area. It was not intended to adopt a method of cultivation which would require the employment of hand labour to any unusual extent. The main object was to direct the attention of farmers to the easy practicability of keeping cattle in larger numbers, than has been their custom, on the moderate and small sized farms of Canada.

The soil in that part of the farm devoted to this experiment is of a clay and sand loam; about five acres of it are of a light sandy loam; and about three acres of it are of a peaty loam. A dressing of barnyard manure was given to twenty-nine acres of the area in the spring of 1891, at the rate of from 18 to 20 tons per acre.

It was mentioned in my report of last year that the yield of crops in 1891, did not come up to our expectations. A hailstorm on 13th of August, 1891, injured the crops on it, and was estimated to have lessened the returns and the feeding value of them by 25 per cent. The following is a summary of the crops harvested in 1891:—

TOTAL YIELD OF CROPS FROM 40-ACRE LOT IN 1891.

Ripened Crops.

		Lbs. of Straw.	Lbs. of Grain.
8 acres,	Mixed Cereal crop	26,454	13,245
3 acres	Golden Vine Pease		905
	Goose Wheat	1,003	437
	Beardless Barley	3,102	1,373
	Banner Oats	2,790	2,060
3 acres,	Mixed Cereal crop	10,442	4,345
14	Totals	43,791	22,365

Root Crops.

		Lbs.
1 acre, Carrots		26,785
1 acre, Mangels and Turnips	Mangels	8,110
	Turnips	9,655
1 acre, Turnips		29,584
3	Total	74,134

½ acre, Cabbage and Kohl Rabi	15,296

Cured Fodder Crops.

		Lbs.
2 acres,	Spring Rye	14,080
	Mixed Cereal crop (second cutting)	1,825
1 acre,	Indian Corn, stooked and cured	11,940
11½ acres,	Indian Corn, put into silos..........130 tons+	1,750
14½		

1½ acres, Indian Corn, fed green to cattle from 7th of August.
3⅔ acres, Mixed Cereal crop, fed green to cattle.
4⅓ acres, pastured.

The total cost for labour in the growing of these crops of 1891, and in the delivering of them at the barn, silos or stable, threshed or cut and ready to feed, was as follows;—

Hauling and spreading of manure	$109 62
Ploughing, harrowing, sowing and planting	114 00
Hand cultivating and weeding	85 62
Cultivating by horse	23 65
Reaping, teaming, threshing, cutting, grinding, &c	223 70
Other labour	9 15
	$565 74
Permanent improvements, draining and fencing	33 50

The time of a team and man was charged at the rate $2.50 per day and the time of a man at $1.25 per day.

TOTAL YIELD OF CROPS FROM 40-ACRE LOT IN 1892.

Cereal Crops.

	Lbs. of Straw.	Lbs. of Grain.
8·75 acres, Mixed Cereal crop, as in Table I	25,039	13,317

	Lbs., cured Fodder.
5 acres, Mixed Cereal crop, as in Table II	32,605

	Lbs. green Fodder.
1·75 acres, Mixed Cereal crop (fed green)	22,801
3·25 acres, Fall Rye	26,155
1·9 acres, Spring Rye.	15,910
second cutting of do. (partly cured)	4,040

Root Crops.

	Lbs.
2 acres, Carrots, as per Table III	51,015
2 acres, Mangels do	57,128
1 acre, Greystone Turnips (catch crop after crop of mixed cereals)	20,305

Indian Corn Crops.

	Tons.	Lbs.
9 acres, Indian Corn, as per notes, plots Nos. 1 to 6....	156	352
3 acres, Indian Corn, do do 7 to 9....	39	1065
3 acres, Indian Corn, do do 10........	38	860
·46 acre, Indian Corn and Sunflowers.....	4	1720
·46 acre, Sunflower heads.	3	710
·41 + acre, Horse Beans..............	2	1760
2·43 acres, pastured...		

NOTES ON THE CEREAL CROPS.

8 *acres of Mixed Cereal Crops.*—The soil on which these were grown was a sandy loam, rather uneven in character; part of it was of a peaty nature with interruptions of clay and sandy soil of a whitish colour. Most of the land had formed part of a wet swamp five years before; and portions of the surface soil had been burned during the clearing of it. In the spring of 1891 it received a dressing of barn yard manure at the rate of about 18 tons per acre. A crop of fodder corn was taken off 7 acres of it during that season; the other acre was cropped in 1891 with mixed cereals.

A different mixture, of *Campbell's White Chaff Wheat*, *Peerless White Barley*, *Banner Oats* and *Golden Vine Pease*, was sown on each plot. By reason of the uneven character of the soil, the yields per acre from the different mixtures did not give results which can be relied upon as evidence of the best combinations of these grains for fodder crops.

TABLE I.

Number of Plot.	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.	No. 7.	No. 8.
Mixture sown—								
Wheat..................Bush.	½	1	1	....	1	1½	....	....
Barley.................... do	¾	1	....	1	1	....	1½	....
Oats...................... do	1	....	1	1	1	....	....	1½
Pease..................... do	¾	1	1	1	....	1½	1½	1½
Flax...................... Lbs.	3	3	3	3	3	3	3	3
Total, Bush. and Lbs....	3 3	3 3	3 3	3 3	3 3	3 3	3 3	3 3
Yield of straw and grain ....Lbs.	4,742	4,002	4,632	4,222	4,312	4,342	3,542	4,572
Grain from thresher......... do	1,598	1,361	1,516	1,522	1,337	1,490	1,479	1,600

These mixtures were all sown on May 4, and came up from May 14 to 15. They were ripe from August 13 to 17 and were cut between August 15 and 17. The different grains ripened together, with the exception of the oats, which ripened one or two days before the other sorts. The one mixture which did not contain pease (plot No. 5) gave the smallest yield of grain per acre.

The ¾ acre of Mixed Cereal crop was grown on an odd strip of land, which had been manured in the spring of 1891. A crop of Indian corn was taken off, and it received a light dressing of barnyard manure in the spring of 1892. The mixture sown was *White Connell Wheat*, *Oderbruch Oats* and *Mummy Pease*, at the rate of one bushel of each per acre. It was sown on May 4, and it came up and was cut at the same dates as plots Nos. 1 to 8. The total yield was,—straw and grain, 3,990 lbs.; grain from the thresher, 1,414 lbs.

5 *acres of Mixed Cereal crop.*—Five plots of one acre each were sown with different mixtures of *Goose Wheat*, *Kinver Barley*, *Banner Oats*, *Multiplier Pease* and 3 lbs. of Flax per acre. The soil of plots Nos. 1 and 2 was a mellow loose sandy loam. It had been cropped in 1891 by rye, which was cut green, followed during the same season by Hungarian grass. A dressing of manure at the rate of 10 or 12 tons per

acre was applied in the spring of 1892. Plots Nos. 3, 4 and 5 were on land which had been manured in 1891 and had been cropped during that season with roots. No manure was applied to them in 1892.

TABLE II.

Number of Plot.	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
Mixture sown—					
Wheat .... Bush.	$\frac{1}{2}$	1	1	....	1
Barley .... do	$\frac{3}{4}$	1	....	1	1
Oats .... do	1	....	1	1	1
Pease .... do	$\frac{3}{4}$	1	1	1	....
Flax .... Lbs.	3	3	3	3	3
Total .... Bush. and Lbs.	3 3	3 3	3 3	3 3	3 3
Yield of cured fodder .... Lbs.	7,991	5,556	5,376	6,606	7,076

These mixtures were all sown on April 30, and came up May 13 and 14. They were cut for cured fodder on August 6 and 8. On account of the wet weather which prevailed, the crops from the different plots did not reach a uniform state of dryness; the weight which is recorded for plot No. 1 was obtained from weighing part of the crop when it was comparatively wet.

1·75 *acres Mixed Cereal crop.*—The soil was clay loam; it received a light dressing of manure in the spring of 1892 at the rate of about 10 tons per acre. The crop was cut and fed green to the cattle from day to day. The total yield of green fodder was 22,801 lbs.

COST OF LABOUR FOR GROWING MIXED CEREAL CROPS.

The following statement of the cost of labour for growing 13$\frac{3}{4}$ acres of mixed cereal crops, may afford useful information for the making of comparisons between the cost of this and other kinds of fodder.

Rent of land, at $3 per acre	$ 41 25
Ploughing, at $2 per acre	27 50
Harrowing twice, rolling once at 20 cents per acre each.	8 25
Seed, 3 bushels per acre	24 75
Sowing 1$\frac{6}{10}$ days at $2.50 per day	4 00
Cutting with mower, 3$\frac{8}{10}$ days, at $2.50 per day	9 50
Labour, turning and cocking, 9 days at $1.25 per day	11 25
Drawing in, 3 days at $2.50 per day	7 50
Labour, loading and unloading, 11 days at $1.25 per day.	13 75
Horse-rake and horse-fork, 1$\frac{4}{10}$ days at $1.50	2 10
Threshing (8$\frac{3}{4}$ acres), 10 days at $1.25 per day	12 50
Man at engine	1 50
Proportion of time of farm foreman	27 50
	$ 191 35

These figures do not include any allowance for the use of farm machinery, nor do they include any amount as an equivalent for the exhaustion of the soil. The cost for labour, without threshing, is $12.90 per acre. The average yield of the cured fodder crops from 5 acres was 3 tons 521 lbs. per acre, which gives an average cost of $3.95 per ton for labour of growing, including cost of seed and rent of land.

CROPS OF RYE FOR FODDER.

3·25 *acres of Fall Rye.*—Fall rye of the variety *Reading Giant* was sown in September, 1891, on light sandy loam. It followed a crop of fodder corn which had been taken off in 1891. Part of the rye crop was f d green, the remainder of it was

cut on 15th June and put into a silo. It was run through a straw cutter. The total yield was 13 tons 155 lbs.

1·9 *acres of Spring Rye.*—This was sown on a light clay loam soil, lying adjacent to the pasture plot, for the purpose of seeding it down. It yielded 7 tons 1,910 lbs.

Cost of labour for growing crop of Rye for fodder.

The following is a statement of the cost of labour for growing 5·15 acres of rye and putting the crop in the stable and the silo.

Rent of land, at $3 per acre	$ 15 45
Ploughing, at $2 per acre	10 30
Harrowing twice, rolling once, at 20 cents per acre each	3 09
Seed, $7\frac{1}{2}$ bushels at $1 per bushel	7 50
Sowing $\frac{5}{10}$ day at $2.50 per day	1 25
Cutting with binder and mower, $1\frac{2}{10}$ days at $2.50 per day	3 00
Drawing in, 1 day at $2.50	2 50
Labour, loading and cutting, 5 days at $1.25 per day	6 25
Man at engine	1 50
Binding twine, 16 lbs. at 11 cents per lb	1 76
Stablemen's time, taking in the part fed green	2 25
Proportion of time of farm foreman	10 30
	$ 65 15

These figures do not include any allowance for the use of farm machinery, nor do they include any amount as an equivalent for the exhaustion of soil. The cost for labour was $12.65 per acre. The average yield of the rye fodder, weighed green, was 4 tons 64 lbs. per acre, which gives an average cost of $3.13 per ton, for labour of growing, including cost of seed and rent of land.

Root Crops.

4 *acres of Root Crops.*—The soil was a sandy loam with a distinctly peaty character. It received a dressing of barnyard manure at the rate of about 18 tons per acre in the spring of 1891. In that season a crop of mixed cereals was taken off. No manure was applied in 1892. Carrots and mangels were put in rows 2 feet 3 inches apart. They were sown from May 10 to 13. The mangels came up from May 23 to 24; and the carrots came up from May 24 to 30. All of the 8 plots of $\frac{1}{2}$ acre each were cultivated with a small hand cultivator on June 4, and with a horse cultivator on June 7 and June 23. They were thinned from June 28 to July 5. They were pulled October 22. The yields are given in the following Table.

Table III.

Plot No.	Varieties of Carrots.	Yields per $\frac{1}{2}$ Acre.
1	Steele's Improved Short White	7 tons 260 lbs.
2	Rennie's New Mammoth Intermediate	7 " 1,330 "
3	Pearce's Orange Giant	5 " 285 "
4	Steele's Guerande or Ox Heart	5 " 1,140 "
	Varieties of Mangels.	
5	Rennie's Selected Mammoth Long Red	8 " 525 "
6	Pearce's Canadian Giant	8 " 750 "
7	Steele's New Giant Yellow Intermediate	5 " 1,816 "
8	Rennie's Giant Yellow Globe	6 " 37 "
	Total from 4 acres	54 tons 143 lbs.

Cost of Labour for Growing Roots.

The following is a statement of the cost of labour for growing 4 acres of roots (carrots and mangels) and putting the crop in the root-house.

Rent of land, at $3 per acre	$ 12 00
Ploughing, at $2 per acre	8 00
Harrowing twice, rolling once, at 20 cts. per acre each	2 40
Seed, carrots, 10 lbs., at 50 cts. per lb.	5 00
Seed, mangels, 10 lbs., at 20 cts. per lb.	2 00
Sowing, $1\frac{5}{10}$ days, at $1.25 per day	1 88
Cultivating by hand, 3 days, at $1.25 per day	3 75
Cultivating with single horse, $5\frac{7}{10}$ days, at $1.50 per day	8 55
Labour, thinning, $11\frac{5}{10}$ days, at $1.25 per day	14 38
Labour, hoeing, 21 days, at $1.25 per day	26 25
Labour, pulling, 25 days, at $1.25 per day	31 25
Drawing in, $3\frac{2}{10}$ days, at $2.50 per day	8 00
Proportion of time of farm foreman	12 00
Total	$135 46

These figures do not include any allowance for the use of farm machinery, nor do they include any amount as an equivalent for the exhaustion of soil. The cost for labour was $33.86 per acre. The average yield of the roots was 13 tons 1,035 lbs. per acre, which gives an average cost of $2.50 per ton, for labour of growing, including cost of seed and rent of land.

Indian Corn Crops.

9 *acres of Indian Corn.*—The soil for the six plots of corn in this division, was a clay loam which had been cropped with mixed cereals in 1891. It had not been manured for at least six years. In the spring of 1892, it received a dressing of barnyard manure at the rate of about ten tons per acre.

Plot No. 1 contained 2 acres. It was planted by the use of a hand corn planter on 18th of May, with *Thoroughbred White Flint* corn, in hills 3 feet apart both ways, with from 4 to 5 grains per hill. Some of it came up 1st and 2nd of June, but more than one-half of the kernels rotted in the ground, apparently by reason of the cold and wet weather which prevailed. It was harrowed on the 4th of June, and the blank hills were replanted on 10th June.

On 29th June, two or three grains of *Asparagus Pole Beans* were dibbled in beside every hill of corn in two rows; the next two rows of corn were left without beans; beans were planted at every hill in the next two rows, and in every alternate two rows across the whole plot. The beans came up 9th and 10th July. They gave a rather spindling growth of vines and bore fairly long pods which were filled but not ripened.

The ears on the corn reached the early milk stage; but on the whole, the crop was not sufficiently advanced in growth to make the best quality of ensilage. The leaves were dried and withered to a considerable extent as the result of frost on 9th September. It was cut 26th to 27th September. The total yield from the two acres was 43 tons 1,830 lbs., weighed without being wilted.

Plot No. 2 contained 2 acres. It was planted with *Longfellow* corn, at the same time and in the same way as plot No. 1. It came up on the 2nd of June and was harrowed 4th of June.

On the 29th of June, *Butter Pole Beans* were planted at every hill in every two alternate rows as in plot No. 1. These beans rotted in the ground at nine hills out

of ten. The few which grew were not vigorous, and did not have any appreciable value in the crop.

The corn reached the glazing stage of growth, before it was caught by a frost on the 9th of September, which caused the leaves to become dry and withered. The total yield from the 2 acres was 36 tons 733 lbs., weighed without being wilted.

Plot No. 3, contained 2 acres. It was planted with *Pearce's Prolific* corn, at the same time and in the same way as plots Nos. 1 and 2. It came up on 2nd of June and was harrowed on the 4th of June.

On 29th of June, *Dutch Case Knife Pole Beans* were planted at every hill on every two alternate rows, as in plots Nos. 1 and 2. These beans came up 9th and 10th July, and reached the stage of growth when the pods were fit for cooking as a table vegetable.

The corn reached the glazing stage of growth. The leaves were dried and withered in consequence of frost before it was cut. The total yield from the 2 acres was 29 tons 539 lbs., weighed without being wilted.

Plot No. 4 contained 1 acre. It was planted on May 25th with *Pearce's Prolific* corn in hills 3 feet apart both ways, with from 4 to 5 grains per hill. It came up June 3 and was harrowed June 4. Part of this plot was cut green from August 31 for feeding the cattle daily. When the remainder of it was cut for the silo on September 13 it had reached the glazing stage of growth. The total yield from the one acre was 16 tons 950 lbs., weighed without being wilted.

Plot No. 5 contained 1 acre. It was planted with *Longfellow* corn, at the same time and in the same way as plot No. 4. It also came up and was harrowed at the same time. The crop on this plot was cut from August 12, and was fed to the cattle daily until August 31. The total yield from the one acre was 15 tons 1,045 lbs.

Plot No. 6 contained 1 acre. It was planted with *Thoroughbred White Flint* corn, at the same time and in the same way as plots Nos. 4 and 5. It also came up and was harrowed at the same time. The crop on this plot reached the early milk stage of growth, and was not near enough to maturity to yield the best quality of ensilage. The total yield from the one acre was 20 tons 1,125 lbs., weighed without being wilted.

3 *acres of Indian Corn.*—The soil was a sandy loam, which had received a dressing of barnyard manure in 1891, had been cropped by Indian corn, and had received a dressing of barnyard manure in the spring of 1892 at the rate of about 10 tons per acre.

Plot No. 7 contained 1 acre. It was planted on May 25, with *Longfellow* corn, in hills 3 feet apart both ways, with from 4 to 5 grains per hill. It was harrowed on June 2 and came up June 3. It had reached the glazing stage of growth before it was caught by a frost on September 9, which caused the leaves to become dry and withered. It was cut and put in a silo on September 21 and 22. The total yield from the acre was 10 tons 1,895 lbs., weighed without being wilted.

Plot No. 8 contained 1 acre. It was planted at the same time as plot No. 7, with *Longfellow* corn; but in this case the corn was grown in rows 3 feet apart, with from 3 to 4 grains per lineal foot in the rows. The total yield from the acre was 11 tons 1,525 lbs., weighed without being wilted.

Plot No. 9 contained 1 acre. It was planted on May 26 with a mixture of equal parts of *Longfellow* corn and *Horse Beans*, in rows 3 feet apart, at the rate of 24 lbs. of the mixture per acre. The beans grew in the rows with the corn to a height of from 3 feet to 3½ feet, and carried pods which in a few instances contained ripened beans. The bean stalks in most cases were green and succulent when the crop was cut. The corn had reached the glazing stage of growth. The whole crop was put into a silo on September 21. The total yield from the acre was 16 tons 1,645 lbs., weighed without being wilted.

3 *acres of Indian Corn and Horse Beans.*—The soil of this plot was a mellow sandy loam. A crop of fall rye had been grown upon it, and had been cut on 15th June. A dressing of barnyard manure at the rate of 8 to 10 tons per acre was applied. On 18th June it was planted with a mixture of *Smut Nose Flint* corn and horse beans, in rows 3 feet apart, at the rate of 12 lbs. of each per acre. The corn was entirely eaten off by crows. It was replanted on 29th June, and suffered a like fate from the crows, in spite of scarecrows and corn soaked in a mixture of Paris green, &c. It was planted the third time on 6th July, with the mixture of *Smut Nose Flint* corn and *Horse Beans.* It came up 12th July. The corn attained a height of about 6 feet and reached the stage of growth when ears were beginning to appear. The bean stalks were from 3 feet to 3½ feet in height, but pods were not formed on them. On 15th September the crop was cut and put into a silo without being wilted. The leaves of the corn were dry and withered from a frost which came on 9th September. The total yield from the 3 acres was 38 tons 860 lbs.

Cost of Labour for growing Indian Corn for Fodder.

The following is a statement of the cost of labour for growing 15 acres of Indian corn and putting the crop into silos or the stable for feeding cattle.

Rent of land, at $3 per acre	$ 45 00
Ploughing, at $2 per acre	30 00
Harrowing 3 and 4 times, 20 cents per acre per time	10 80
Marking hills, $1\frac{2}{10}$ days, at $1.50 per day	1 80
Marking hills, 1 day at $1.25 per day	1 25
Seed	7 50
Sowing, 1 day at $2.50	2 50
Planting by hand, 7 days at $1.25 per day	8 75
Cultivating with single horse, $3\frac{6}{10}$ days, at $1.50 per day.	5 40
Cultivating with team, $7\frac{2}{10}$ days, at $2.50 per day	18 00
Hoeing, 16 days at $1.25 per day	20 00
Cutting in field and at silo, 67 days at $1.25 per day	83 75
Drawing in, 13 days at $2.50 per day	32 50
Man at engine, 7 days at $1.50 per day	10 50
Use of engine and fuel, 6½ days at $5 per day	32 50
Proportion of time of farm foreman	30 00
	$340 25

These figures do not include any allowance for the use of farm machinery (except the engine), nor do they include any amount as an equivalent for the exhaustion of soil. The cost for labour was $22.68 per acre. The average yield of the corn was 15 tons, 1,218 lbs. per acre, which gives an average cost of $1.45 per ton, for labour of growing, including cost of seed and rent of land.

REPORT OF THE HORTICULTURIST.

(JOHN CRAIG.)

To WM. SAUNDERS, Esq.,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith a report of some of the work carried on in the Horticultural Department during the year 1892.

As a fruit year, 1892 has been totally different from 1891. The heavy precipitation during May and June, was very favourable to transplanting and nursery operations, but at the same time offered the best possible conditions for the development of injurious fungi. There is little doubt, too, that the excessive rainfall during the blossoming period of fruit trees prevented to some extent perfect fertilization. This effect was particularly apparent in the case of plums, cherries and grapes. In certain sections the total or partial failure of the plum and cherry crop is ascribed to this cause.

The crop of fall apples was a heavy one in northern Ontario and parts of Quebec, but brought poor returns, owing to the lack of demand, and frequently to the lack of enterprise on the part of the grower in seeking markets other than local.

The picking of fruit of this perishable character is often delayed till the fulness of maturity is reached; decay soon follows as a consequence of rough handling and close packing.

A considerable quantity of the Wealthy and Alexander varieties have been shipped from Montreal to Britain the past season, with fairly satisfactory results.

Duchess, has also been shipped to England, from Grimsby, Ont., and arrived in fair condition. In order to accomplish this successfully they must be picked before being completely coloured. The successful shipment to Europe of this class of fruits can be accomplished only by the exercise of the greatest care and judgment on the part of the grower in picking, grading, packing and shipping. Considerable discredit has fallen on Canadian apples the past season on account of the wilful or negligent disregard of fundamental principles in packing and grading fruit, viz., to pack with judgment and honesty.

The search for a hardy prolific winter apple of good quality and appearance, adapted to the export trade, still goes on; but no variety with such a valuable combination of good qualities has yet appeared.

In the province of Quebec "Golden Russet" is growing in favour, and will be more extensively planted. The tree is hardy. It is slow in coming into bearing, but it is a regular annual bearer afterwards. The fruit too is always salable and there is no loss from "apple scab" and little from Codlin moth. "La Rue," a large showy early winter apple, originating near Brockville, and introduced by Mr. D. Nicol, of Kingston, is likely to prove valuable. The tree is hardy and vigorous, but Mr. Nicol points out that it must be planted on strong soil, receive good cultivation and liberal manuring; otherwise it will prove unsatisfactory. That real progress is being made in orchard management is evidenced by the rapidly growing interest evinced by farmers and fruit growers in methods of destroying injurious insects and preventing fungous diseases. Spraying with arsenical and copper compounds, is now being practised by the leading fruit growers of the Dominion. A drawback to the rapid extension of this work exists in the fact that we have no large manufacturers of spraying pumps and nozzles in the Dominion. A very serviceable force pump is, however, recently offered for sale by Mr. W. H. Vanduzer, of Grimsby, Ont. Other than this there are none manufactured for this special purpose in the Dominion that I know of. Canadian fruit growers should be able to purchase from home

manufacturers the various kinds of spraying apparatus needed for the destruction of fungus and insect pests, such as hand, knapsack, barrel and horse pumps, fitted with suitable nozzles. In this connection I take pleasure in mentioning a hand pump called the "Victor" sent me for trial by Mr. M. B. Brooks, of Oak Point, N.Y. It possesses the great advantage of not having to be held in or attached to the pail, while pumping is going on. The handle or piston is simply pressed down and lifts itself by means of a spring, thus making its own suction at the same time. If the pump proves durable, it certainly is much to be commended. It is quoted at $3.50.

I have found it impossible in the space allotted me to treat several lines of experimental work which have either been inaugurated or have been in progress during the year. Experiments with vegetables, such as varietal tests, methods of cultivation and effect of fertilizers have been in progress, but the results are held over, till added experience gives them greater weight and renders them more conclusive. During the year a special study has been made of certain hardy varieties of "Morello Cherries" which have been on trial here for the past four years. Bulletin No. 17, published at the close of the year, gives the results of this investigation.

Attention is drawn in the following pages to a consideration of the value of our native plum, as a fruit particularly adapted to the colder sections of the Dominion.

A few of the more destructive fungous diseases are briefly described. The remedies suggested are either the outcome of the results of experiments carried on here, or have been suggested by other workers in this field. This division of the work has been treated at some length on account of the present wide spread interest exhibited in the destruction of these foes to agriculture by farmers and fruit growers generally.

A brief account of the work of distributing forest tree seedlings and cuttings is given, together with some abstracts of letters from parties who have been testing the trees sent out from the Farm. It is a great pleasure to record the unfailing courtesy which I have received at the hands of a number of specialists in horticulture and botany in the United States, to whom I am indebted for much valuable assistance rendered in various ways. I wish to mention particularly "Dr. B. D. Halsted, of New Brunswick, N. J." "Mr. D. G. Fairchild of Washington, D. C." "Prof. F. Lamson Scribner, Knoxville, Tennessee," eminent authorities on plant diseases; "Prof. Goff of Madison, Wisconsin," and "Prof. Bailey of Cornell University, N.Y.", leading horticulturists. Among Canadian co-workers I wish to acknowledge aid given me by Messrs. Dunlop and Brodie of Montreal, Mr. R. B. White of Ottawa, and Mr. L. Woolverton, M.A., editor of the "Canadian Horticulturist." I have also received from Mr. J. C. Chapais, St. Denis, P.Q., Assistant Dairy Commissioner of the Dominion, interesting and valuable notes on the progress of his experimental orchard, which I hope to use in connection with other information now being collected. The experience gained from Mr. Chapais's experimental orchard at St. Denis, Que., will be of much value to fruit growers in the Lower St. Lawrence. It gives me a great deal of pleasure to record the faithful services rendered by Mr. Wm. Taylor, who, as foreman of the horticultural department, has at all times exhibited commendable zeal, care, and perseverance in carrying on the various lines of work entrusted to his care.

I have the honour to be, sir,

Yours obediently,

JOHN CRAIG,

Horticulturist.

NATIVE PLUMS.

Up to the present very little attention has been given in Canada to the cultivation and improvement of our native plums. Few lines in horticulture, offer greater inducements, however. Comparatively little has been accomplished in the United States by systematic effort, yet since the introduction of the Wild Goose plum about forty years ago, more than 150 varieties have been named and disseminated. This

remarkable increase in number of varieties is only surpassed by the marvellous progress made in the development of the American grape.

The value of the native plum has not yet been recognized to any extent, except in sections where the severity of the climate precludes the easy or profitable culture of varieties belonging to the *Prunus domestica* class. Without doubt, however, there are improved varieties of our native plums which may be profitably grown in all portions of the Dominion, including the most favoured localities. There is a wide variation in regard to the hardiness of these varieties, due principally to climatic conditions prevailing in the place of origin. Thus De Soto, belonging to the *Americana* group and originating in Wisconsin, may be taken as the type of hardiness, while Pottawattamie of the *Chickasaw* family, and introduced from Tennessee, is not hardy at Ottawa.

Up to the present year the botanical status of American plums has been very unsatisfactory. An excellent monograph by Prof. L. H. Bailey, recently published by the Experiment Station of Cornell University, N.Y., has been a great assistance in placing these fruits on a sound scientific basis, and will prove of lasting benefit to those who study the native plum and its variations, from the standpoint of systematic botany.

Formerly our cultivated native varieties were grouped under three wild types, (1) *Prunus Americana*, Marshall, the plum of the north and west. (2) *Prunus angustifolia* or *P. chickasa*, Mich., native of the middle and southern States, and (3) *Prunus maritima*, Wangheim, known as the beach plum of the south. Much confusion existed, however, as many of the cultivated forms could not be satisfactorily assigned to any of these original types. As a result of Prof. Bailey's labours, aided by Prof. Sargent, we shall recognize hereafter another class under the name of *Prunus hortulana*, Bailey. This species is made up of what was formerly known as the Wild Goose group, which in the past was generally referred to the *Chickasaw* tribe. This group now occupies an intermediate position between *P. Americana* and *P. Chickasa*. To these three groups belong practically all our cultivated native varieties in Canada, and from them we may expect important additions to our lists in the future.

As already stated *P. Americana* by reason of its natural distribution extending all over the northern part of the continent to Manitoba, and part of the North-west Territories, contains in its variations the hardiest forms of the plum known to cultivators. These are suitable for culture in the coldest parts of the Dominion, and where nothing in the way of fruits, except the Choke (*P. Serotina*) and Pin cherry, (*P. Demissa*) obtain, it is safe to plant improved forms of the native plum *Prunus Americana*.

On account of this wide distribution touching as it does, Manitoba in the north and Texas in the south, there is much variation in the hardiness of the individuals making up the species, and this, as already intimated, is an important point for the consideration of intending planters.

The following cultivated varieties belong to *Prunus Americana* and have been on trial at the Experimental Farm for the past three years. The illustrations given of these fruits have been engraved from photographs of fruit grown here this season.

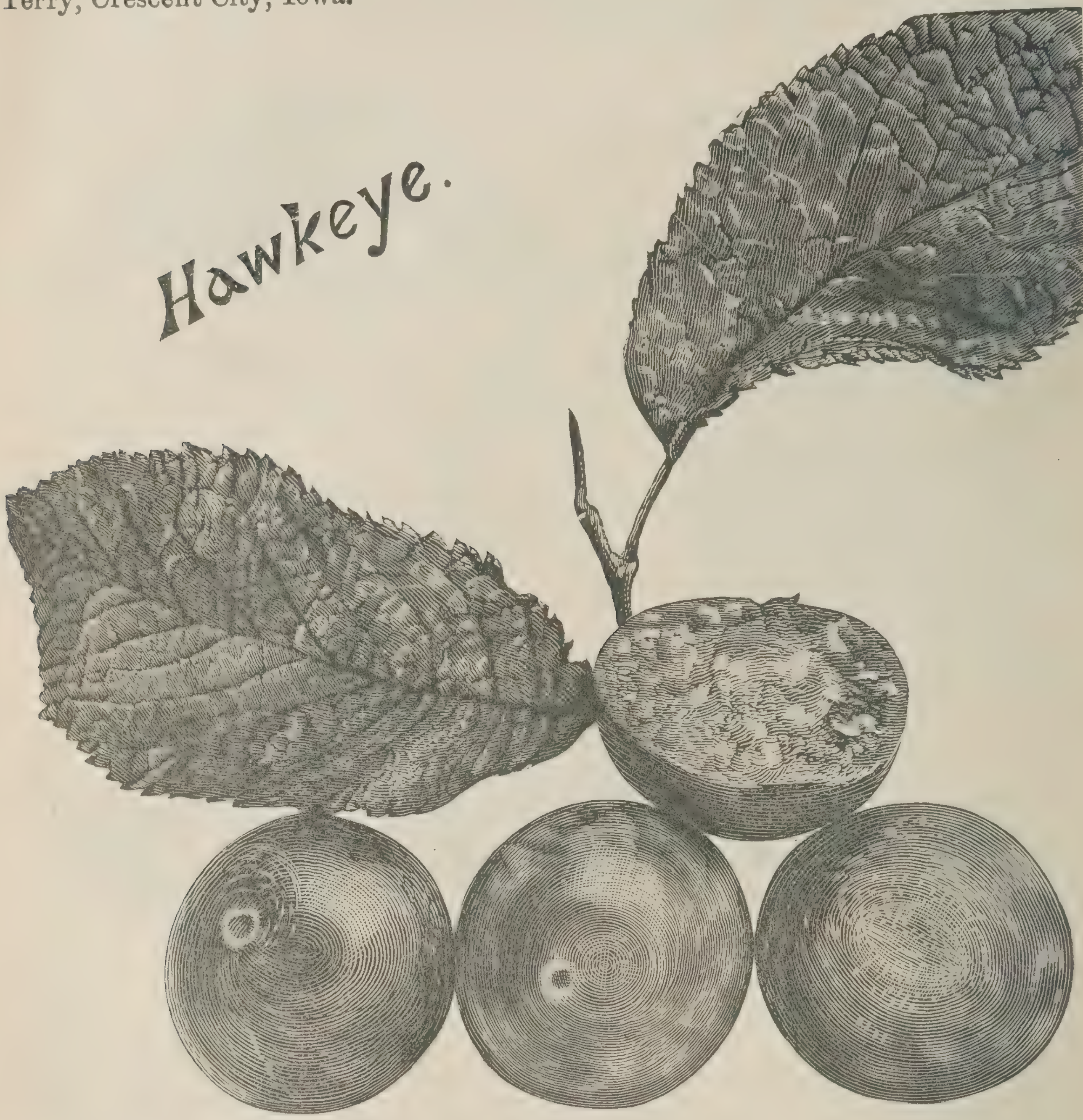
Cheney.—Fruit large, roundish oblong, skin thick, of a dull red color, mottled with yellow. Flesh fairly firm and sweet; quality good. Stone medium size adhering to the flesh. Tree a very vigorous grower, the terminal branches needing shortening annually; remarkably prolific. Ripe at Ottawa the first week of September. This variety originated as a wilding near LaCrosse, Wis.

De Soto.—(Fig. 3.) Fruit medium, to large, round, oblong, sometimes pointed, dark red with a beautiful purplish bloom. Skin thick, flesh juicy, entirely free from astringency. Stone medium size. This is undoubtedly one of the best of the late red plums. Ripening about Sept. 15th. Found wild at De Soto, Wis. Although it was introduced by Elisha Hale of Lansing, Iowa, nearly thirty years ago it has not received the attention which a plum of its excellent qualities deserves.

(Fig. 3.)

Forest Garden.—Fruit medium size, round or slightly egg shaped. Skin thick, yellow, overlaid with darker mottlings, and a light lilac bloom. Flesh yellow, tender with some astringency; fairly good; stone separates readily from the flesh. This tree is a difficult one to manage in orchards, being a rampant grower, throwing out horizontal branches which are apt to break when heavily laden with fruit or during wind storms. Like Cheney the young points of growth need shortening annually

Hawkeye.—(Fig. 4.) Fruit almost round, dark red with lilac coloured bloom, suture indistinctly marked. Flesh deep yellow, firm, juicy. Stone large flat, parts readily from the flesh, equal to De Soto in quality. Ripe Sept. 20th. A valuable late variety which originated under cultivation, and was introduced by Mr. H. A. Terry, Crescent City, Iowa.

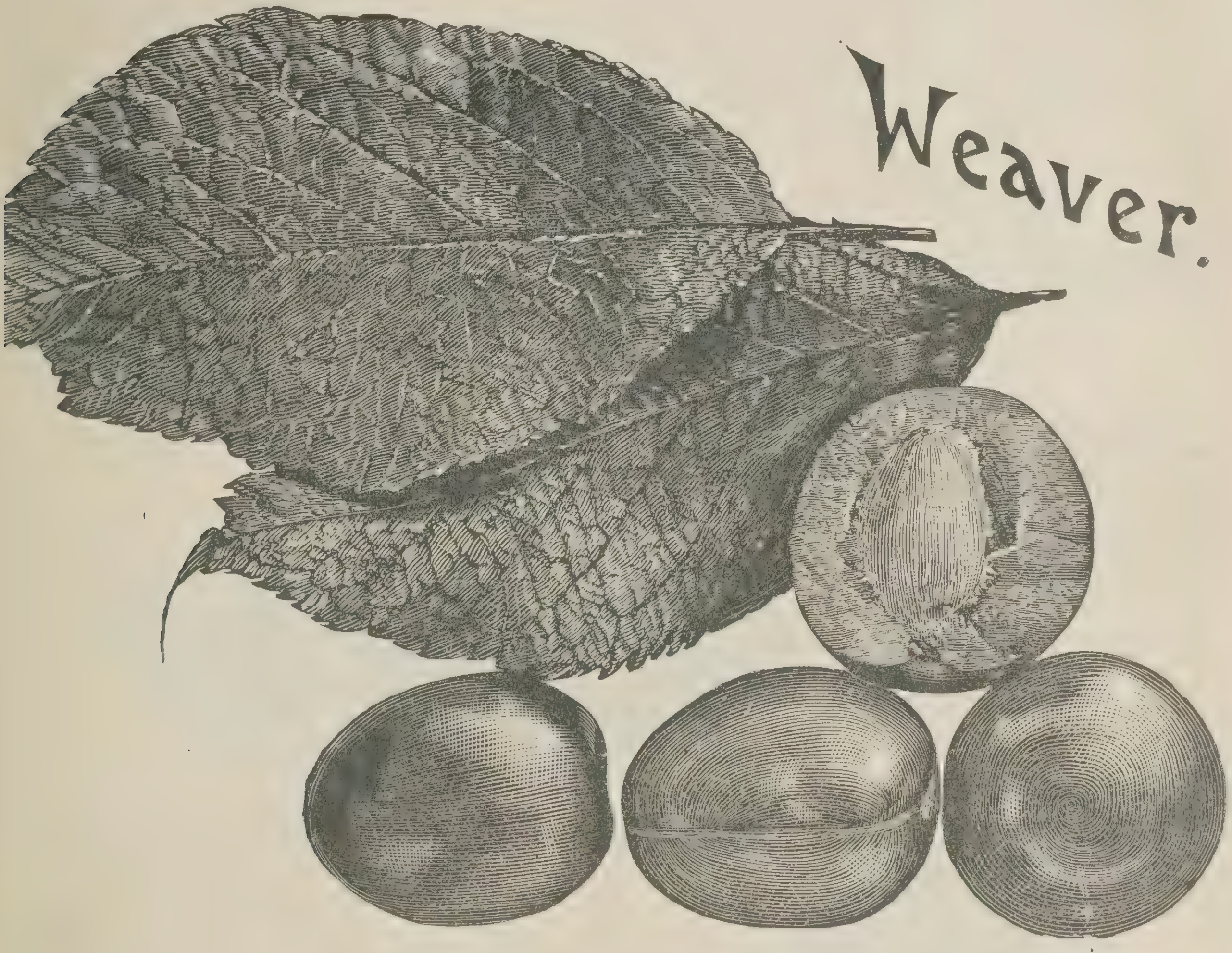


(Fig. 4.)

Ida.—Fruit medium size, oval, with slight suture; skin thick, dark red in colour. Flesh yellow, with little juice; unusually firm for a red plum. Stone, medium size, almost free; fair quality. Hangs well to the tree, and becomes quite sweet and sugary. Ripe soon after the middle of September. Tree hardy and a free grower; originated in Illinois.

Rollingston.—Fruit large, reported very large in some sections; round, flattened at both ends. Skin deep yellow, almost covered with red and purple mottlings. Flesh yellow, firm, good quality. Stone medium to small; cling. Ripens about the middle of September. Found by O. M. Lord, on the banks of Rollingston Creek, Minnesota, and by him introduced into cultivation. This is valuable chiefly on account of its earliness.

Van Buren.—Designated by Prof. Bailey as variety *mollis* of *P. Americana*. The tree is true to the type, but the fruit seems quite distinct, and is among the few red plums having the stone perfectly free. Fruit medium size, roundish oval; skin, thick, yellow with a pink blush. Flesh yellow, sugary, sweet and melting. Picked September 25th this year. It showed a tendency to crack. Not as hardy as any of the preceding. Originated in the State of Iowa.

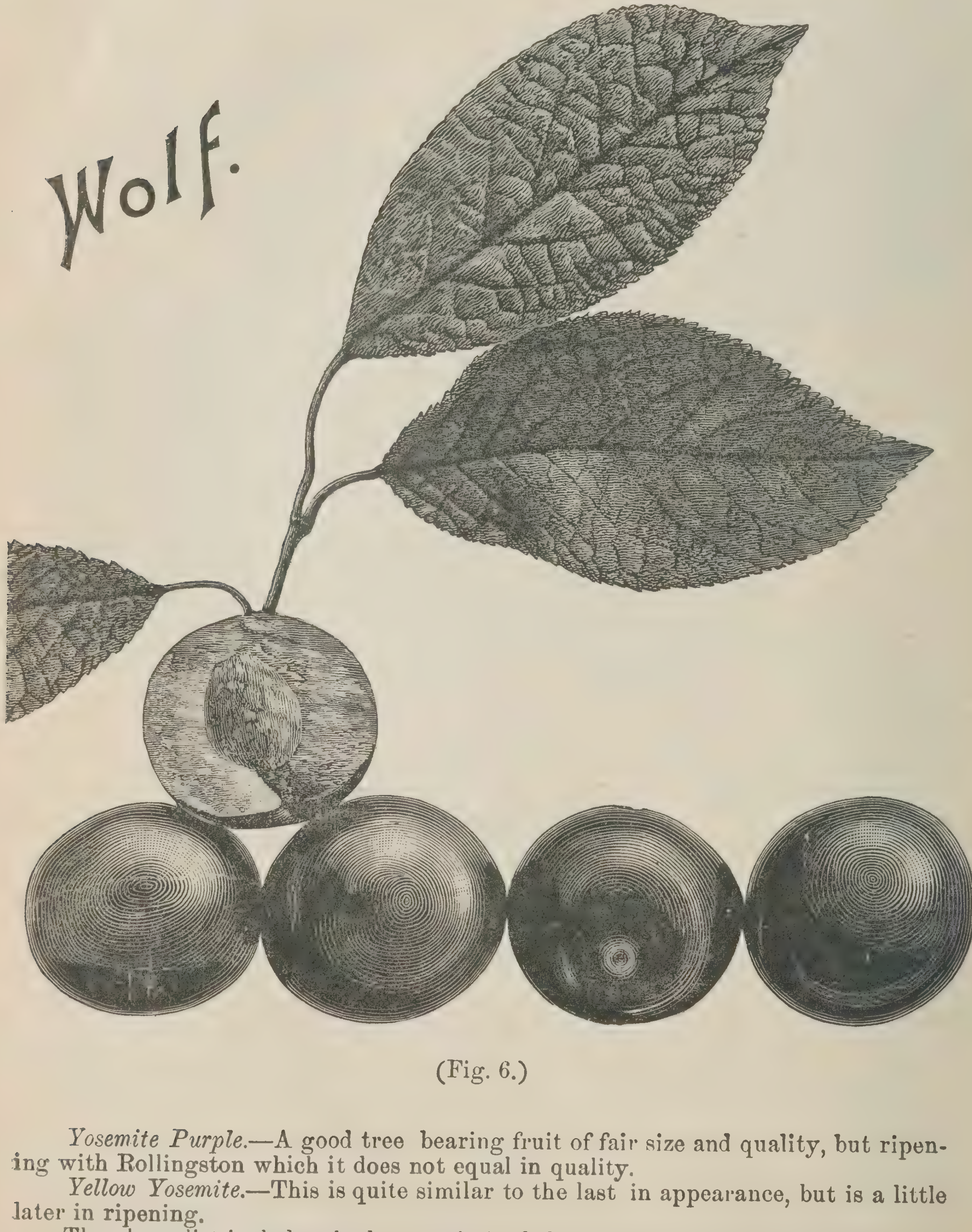


(Fig. 5.)

Weaver—(Fig. 5.) Three trees of this variety planted in 1888, have borne fruit the past three seasons, the last two years very heavily. Fruit large, oblong, flattened, dark red, overlaid with a purplish bloom. Suture well marked; stone long, narrow and flat; semi-cling. Ripens at Ottawa about the end of September. Originated in Northern Iowa, and was introduced by Ennis & Patten, Charles City, Ia., in 1875. This, I believe, will be valuable wherever it will ripen. During the recent meeting of the Ontario Fruit Growers Association at Brantford, the fact that another plum has been introduced in many portions of Ontario under the name of Weaver, was fully demonstrated. The variety fruiting in and about Grimsby, Ont., ripens early in August, whereas the true *Weaver* is one of the latest of the *P. Americana* family.

Wyant.—Tree has failed partially at Ottawa. Fruit of Van Buren type, firm meaty entirely free. Probably more valuable for the South. Prof. Budd describes this as a "free stone variety of great value."

Wolf.—(Fig. 6.) Fruit round, medium to large, dark red covered with dense purplish bloom. Flesh yellow, tinged with red, firm, good quality. Stone separates readily from flesh, a more attractive variety than De Soto, but hardly equal in quality. Tree perfectly hardy, quite distinct from other varieties, having the young shoots heavily covered with a thick pubesence; originated under cultivation in Iowa about 40 years ago. This variety has been widely planted in recent years.



(Fig. 6.)

Yosemite Purple.—A good tree bearing fruit of fair size and quality, but ripening with Rollingston which it does not equal in quality.

Yellow Yosemite.—This is quite similar to the last in appearance, but is a little later in ripening.

The above list includes the best varieties belonging to *P. Americana* which have been fruited at the Central Farm.

VARIETIES RECOMMENDED.

Among those which can be recommended to planters where the finer varieties of *P. domestica* fail, are *Cheney*, *De Soto*, *Rollingston*, *Wolf*, *Weaver* and *Hawkeye*, and if a free stone is desired, *Ida*, *Wyant*, or *Van Buren* may be added.

Chickasaw Plums (*P. Chickasa.*)

Accepting Prof. Bailey's classification as correct, I find that none of the varieties of *P. Chickasa* have proved hardy at Ottawa.

Newman,—which originated in Kentucky some years ago, is one of the best known and most justly popular of this class. It is hardy in Central New York and would probably succeed in Western Ontario. Fruit large, good quality, ripening very late sometimes not before the middle of October.

Pottawattamie.—This highly extolled variety seems to be deserving in many sections of the high measure of praise accorded it. Fruit medium to large, round, light red in color, of good quality. It was introduced by J. B. Rice, of Council Bluffs, Iowa, to whom it came from Tennessee among a lot of Miner plums; not hardy at Ottawa.

Wild Goose Tribe.—*P. hortulana*, Bailey; none of this class are hardy outside of peach growing districts. *Garfield*, *Moreman* and *Wayland* are the most valuable.

Miner has been included as a variety of *P. hortulana*, but it differs so much in general appearance and hardiness of tree as to lead me to believe it to be more nearly related to *P. americana*. This is the oldest native plum known under cultivation. It was raised from seed in Tennessee nearly eighty years ago, and has been widely distributed throughout the Western States. Trees planted eighteen years ago at Abbotsford, Que., are hardy, but as a rule have only given medium crops every other year; ripens early in October. These trees have yielded fuller crops the last few years since being surrounded by seedlings of the Wisconsin wild plum.

Forest Rose belongs to the Miner group but has nothing special to commend it.

Diseases. (See Plum spot p. 102.) They are all more or less liable to attacks of *Septoria*, "shot hole" fungus, but are generally freer than varieties of *P. domestica*. Varieties of *P Chickasa* have exceptionally bright, healthy peachlike foliage. As there are no such things as curculio or knot proof plums, except in a relative degree we may expect to have to fight enemies common to plums when these are planted as with the old varieties.

Propagation.—Varieties of the *Americana* and *Miners* should as far as possible be grown on the stocks of their own type. It is sometimes difficult however, to distinguish scion from stock when these are used. The Chickasaws and Wild Goose Tribe succeed admirably on peach or Marianna stocks and these are preferable to trees on their own roots, on account of their sprouting habits.

Orchard Planting.—Some of the above varieties, Miner and Wild Goose for example, have generally borne larger crops when intermingled with other varieties of plums, for the purpose of more perfect fertilization. While it is not necessary to follow this plan with all varieties—as Wolf and De Soto are always reliable—yet it is a safe principle to practice and one which will generally repay the planter.

Points in Favour of Native Plums.

1. Hardiness and productiveness.
2. Their wide range of adaptability to climatic conditions, and to light as well as heavy soils.
3. Their value for culinary purposes.
4. Their comparative exemption from disease, and the ease with which they can be propagated.

A PARTIAL FRUIT LIST FOR THE PROVINCE OF QUEBEC.

During the year a large number of letters have been received from beginners in fruit growing, asking for information in regard to the best varieties of large and small fruits. As a considerable proportion of these inquiries have come from the Province

of Quebec, I deem it advisable to insert a brief list of the most reliable varieties of large and small fruits suitable to the climate of Quebec and Eastern Ontario.

APPLES—*Summer*—Yellow Transparent, Duchess, Red Astrachan.

Autumn—Alexander, Wealthy; McIntosh Red; Golden White or Titovka (not Tetofsky).

Winter—Pewaukee, Golden Russet, La Rue, Arabka, Longfield, Royal Table.

PEARS—Flemish Beauty, Beurre d'Anjou, Gliva Kurskaya.

PLUMS—Glass Seedling, Blue Damson, Rollingston, De Soto, Wolf.

CHERRIES—Minnesota Ostheim, Montmorency, Riga No. 18, Wragg, Orel No. 25.

GRAPES—Moore's Early, Herbert, Rogers 17 (black), Lady Hayes, Jessica (white), Delaware, Lindley, Vergennes (red).

GOOSEBERRIES—Downing, Pearl, Houghton.

CURRANTS—White Grape, Red Grape, Moore's Ruby, Versaillaise (white and red), Lee's prolific, Black Naples (black).

RASPBERRIES—See next page.

BLACKBERRIES—Agawam, Snyder, Stone's Hardy.

STRAWBERRIES—Crescent, Wilson, Warfield, Haverland, Bubach.

The above list is only intended to serve the purpose of a guide to beginners in fruit growing within the area mentioned. It is wise in all cases to note carefully in order to ascertain extent of and select from the varieties which have been most successful nearest to the locality, in which fruit growing is to be commenced.

RASPBERRIES.

Few of the many new varieties placed upon the market within the last four or five years possess merit over those already in cultivation. Of a large number tested here, and observed elsewhere, I will mention a few which seem to be decidedly promising; others are mentioned in order to correct opinions of their value which may have been over-estimated. In most cases further trial is needed before their actual value can be determined.

Thompson's Early.—Ripens here usually the second week in June. Is of medium size, round, bright red and attractive. Its earliness seems to be its principal good point. Although hardy it has not been productive.

Columbia.—This has not fruited at Ottawa yet, and I speak of it as seen growing at the New-York Experiment Station, at Geneva, where I was very much impressed with the vigour of the plant, quality and size of the fruit. It has also received favorable commendation at the hands of the able editor of the *Rural New-Yorker.* It is believed to be a cross between the Cuthbert and Gregg, aud is intermediate in many characteristics, the fruit being purple and the cane striking root from the tips. Crosses of this parentage, by Mr. Saunders, exhibit the same peculiarities in regard to colour of fruit and method of propagation; it therefore is of the Shaffer type, but the berry is certainly firmer and of better quality, and I am told is a great bearer. This variety originated with Mr. J. T. Thompson, of Oneida, N.Y., who, I believe, controls the stock at present.

Heebner—Is a large red berry of the Clark and Hornet type, in quality it is first class, but not firm enough for distant shipment. It has been on trial at Ottawa for the past four years, having been planted in 1888 by the former Horticulturist (Mr. Hilborn), now of Leamington. The cane is not quite as hardy as Cuthbert but the fine quality of the fruit should give it a place in all amateur collections.

Herstine.—Is another variety which can be recommended for home culture, but is not sufficiently vigorous and productive for market. It is also deficient in pollen, and incomplete fertilization resulting in partially developed berries is occasionally noticed. Herstine and Heebner need winter protection in this locality.

Hansell.—As an early market variety I am inclined to think that this has been underrated It ripens with or before the earliest, and continues giving fair pickings throughout the raspberry season. The berry is of medium size, firm and attractive, bright colour of fair quality. The past two years it has yielded better than Turner.

The cane is not such a strong grower as Turner—needing and paying by increased returns for heavy manuring—but is generally vigorous and quite hardy.

In answer to letters asking for a list of the most desirable varieties for home use the following have usually been recommended :—

For Market	Red.	Hansell. Very early.
		Marlboro. Hardy, attractive, poor quality.
		Cuthbert. Fairly hardy, productive firm, late, good quality.
	Purple.	Shaffer. Specially valuable for canning.
	Black caps.	Mam. Cluster. Early.
		Hilborn. Medium early, productive.
		Gregg. Late.
	Yellow :	Golden Queen. Good quality.

For Home use	Red.	Turner. Early, hardy, good quality.
		Heebner. Medium; needs protection in this vicinity, fine quality.
		Hornet. Late, needs protection in this vicinity, fine quality.
		Cuthbert. Good quality, fairly hardy.
		Purple. Shaffer, canning,
		" Columbia, for trial.
	Black caps.	Doolittle. Early.
		Hilborn, Medium.
		Gregg. Late.
	Yellow :	Brinckle's Orange. Must be protected in winter.
		Golden Queen. Succeeds in the north.

TWO NATIVE GRAPES.

Gibb.

This name has been given to what appears to be a variety of the Canadian Frost Grape, (*Vitis riparia*) which is now cultivated at Abbotsford and St. Hilaire, Que. It seems to have originated as a wilding in the orchard of Mr. Magloire Dery, St. Hilaire, and was brought to Abbotsford about thirty-five years ago by Mr. N. C. Fisk, who planted it in a corner of his garden near a sugar maple. It grew thriftily, soon reaching the top of the tree, and at the present time covers the original tree and two other good sized trees which stand adjacent to it. Since planting this vine, it has not been cultivated or pruned; it has never been injured by winter, and the fruit has always ripened before frost each year. The flavour, however, is not injured by light frosts. * The vine may be described as a fair representative of the wild type *Vitis riparia* of which we have cultivated varieties in a number of seedlings raised by the late Chas. Arnold, of Paris, Ont.

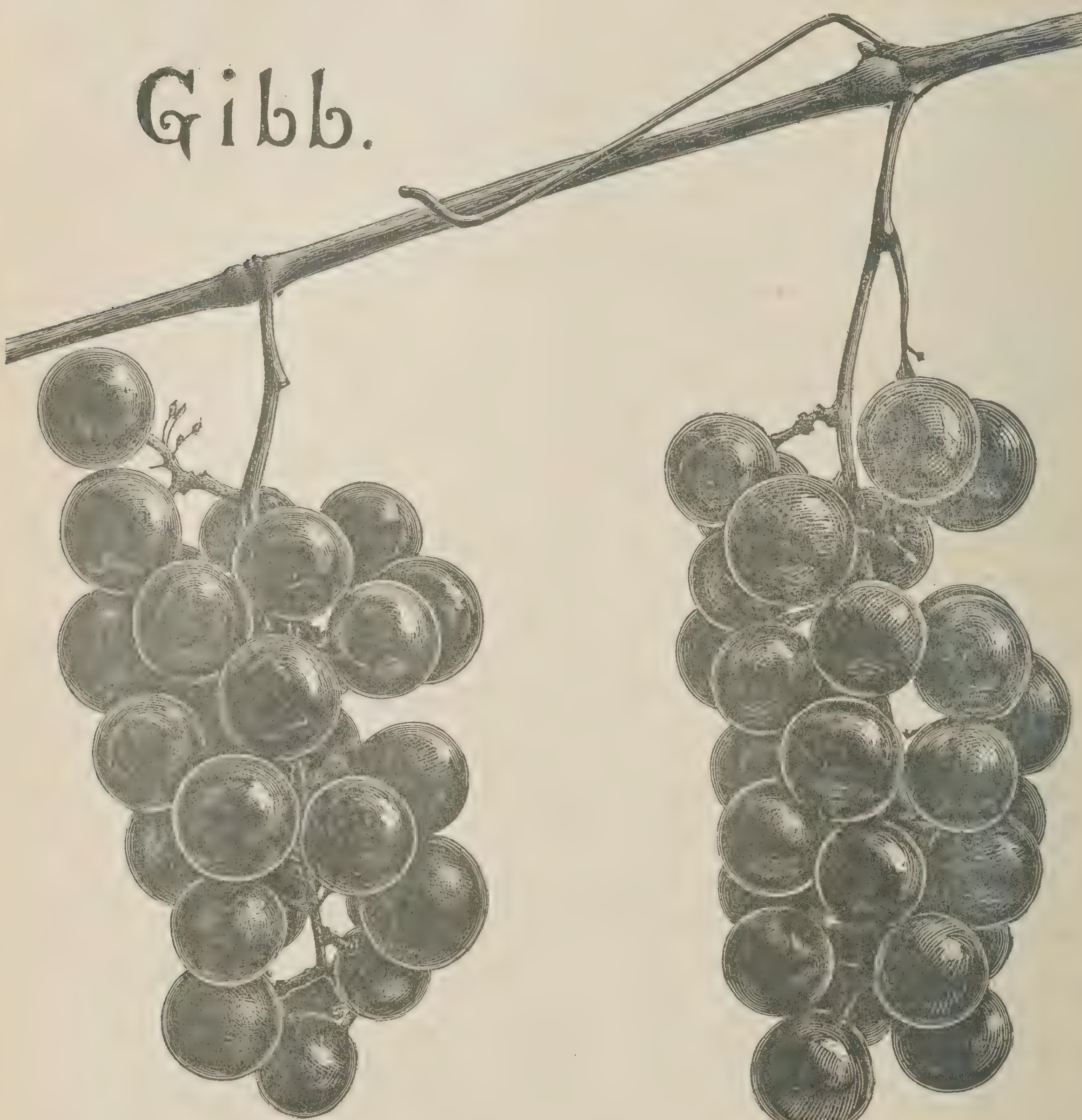


Fig. 7.—In figure 7 two bunches of this grape are shown natural size. Bunch small, rather loose, sometimes shouldered; berry about the size of Clinton, black, with a

* Cuttings were sent to the Experimental Farm four years ago by the late Chas. Gibb, who thought highly of it as an arbor grape.

thick purplish bloom; pulp melting, juicy; seeds few and small; very good. Ripens with or a few days later than Delaware.*

La St. Hilaire.—This variety originated with the late Alexis Dery at the place from which it takes its name, and it is thought by Mr. F. L. Dery who forwarded the sample examined, to surpass the Gibb as a wine grape, and to be more productive. In a letter accompanying samples of fruit of both varieties Mr. Dery says, "the sample of La St. Hilaire sent you is the fruit of a well cultivated and well pruned vine. When properly cared for they will bear from twenty-five to thirty pounds per vine, planted 6x6 feet and trained arbor style on four posts connected by slats." Bunch and berry closely resemble Gibb in appearance. The pulp is tougher with a marked acidity.

The above varieties are noted here because of their probable value for cultivation in the colder sections under ordinary methods, as well as being ornamental and useful in covering arbors or verandahs; and covering stone piles or stone fences, after the method practised by the Rev. Robt. Hamilton, Grenville, and Mr. J. M. Fisk, of Abbotsford, Que., the latter of whom has propagated the Gibb to some extent.

TREATMENT OF FUNGOUS DISEASES.

The excessive rainfall and the humidity of the atmosphere during June and the first half of July rendered the season a particularly favourable one for the development of parasitic fungi, and at the same time increased the difficulty of successfully treating these pests by the ordinary methods of spraying. The almost continual rainfall during the spraying season no doubt prevented many persons who had made arrangements to spray their orchards, from carrying into effect their good intentions.

It should be remembered, however, by every fruit grower that in order to obtain well-developed fruit, the foliage must be healthy, and able to perform all its functions; and further that it is easier in a rainy season by spraying to destroy the form of the fungus attacking the leaf than that attacking the fruit. This may be due to the fact that the spraying compound is not as easily washed off, the more or less hairy surface of the leaf as it is from the comparatively smooth skin of the fruit. By thus preserving the foliage in a healthy condition, not only is the fruit of the current year more fully developed, but the growth of the season more perfectly matured and better fitted for the production of good fruit the following year.

APPLE SCAB.

(*Fusicladium Dendriticum*, Fckl.)

Experiments were undertaken to test the comparative efficacy and cost of Ammoniacal Copper Carbonate and dilute Bordeaux mixture (3 lbs. of copper sulphate and 2½ lbs. of lime) as a remedy for "apple scab." Paris green was added to each mixture at the time of the second spraying.

Conclusions may be summarised as follows:

1. During a rainy season such as the last one, dilute Bordeaux mixture adheres to the foliage better than the Copper Carbonate, and on this account generally gives better results.

2. Bordeaux mixture is more difficult to prepare and apply than Ammoniacal Copper Carbonate.

3. A comparison of the cost of ammoniacal copper carbonate and the diluted Bordeaux, is considerably in favour of the latter.

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* Mr. J. M. Fisk, writing of a vine covering a large stone pile on his farm, says, "it was planted about 1875, never has received any cultivation, and for several years back has borne annually about 25 lbs. of fruit which has been sold at 5 cents a pound in St. Hyacinthe as a wine grape; a slight frost improves the quality. I have never seen the least indication of its being injured by our cold winters, not even that part of the vine which entwines itself among the branches of the apple trees near the stone pile, and is exposed to all the changes of temperature of this climate varying from 95° in summer to 30° below zero in winter. On this account I think it will be valuable for the North-west, and for covering arbors."

4. When spraying on a large scale is contemplated, the Copper Carbonate should be prepared according to directions given at p. 146, in the report for 1891. This method will materially lessen the cost of the material.

5. It will pay every fruit grower to spray annually, using judiciously either of the above fungicides.

In this connection, I deem it of importance to append the experience of Mr. R. Brodie, a progressive fruit grower, of St. Henri de Montréal, who writes as follows:

"Our experience in spraying with fungicides this year has been very unsatisfactory on account of so much wet weather, at the time of making the applications. One orchard was sprayed three times with Ammoniacal Copper Carbonate, but it rained a few hours after each application.

There was no apparent difference between these apples and others which had not been sprayed. One day's picking gave 11 bbls. No. 1, 30 bbls. No. 2, and 20 bbls. of culls. Another orchard was also sprayed three times. It rained almost immediately after each of the first two applications, but after the third application there was no rain for ten days. The yield of one day's picking was 10 bbls. No. 1, 10 bbls. No. 2 and 5 bbls. culls. In the case of those trees not sprayed in this orchard they were so badly spotted, that we did not sort them, but merely shook them off the trees.

Another young orchard, favourably situated in a dry airy position, we did not spray, and found them so badly spotted that we shook them off instead of hand picking. Even though the trees were young and vigorous and situated on an airy hill top, they were spotted worse than any on the farm. The season was too unfavourable to make a comparative test of Bordeaux mixture and Copper Carbonate, but so far I think the Ammoniacal Copper Carbonate is the best and much easier applied than the Bordeaux mixture as the lime in the latter is apt to choke up the nozzle."

GOOSEBERRY MILDEW.

(*Sphaerotheca mors-uvae*, B. & C.)

It is gratifying to note among fruit growers the increasing interest taken in the cultivation of the English gooseberry. Hitherto its cultivation has been restricted to localities peculiarly favoured in regard to soil and climate. As a general rule, it has proved unprofitable on account of its susceptibility to mildew of the foliage and fruit.

The efficacy of spraying as a remedy, has now passed the experimental stage, and I have endeavoured during the past season to determine which of the fungicides, found to be effective in preventing the spread of the disease, could be recommended as the most advantageous. The following agents were used:—

1. Potassium Sulphide—(Liver of sulphur.)
2. Ammoniacal Copper Carbonate.
3. Dilute Bordeaux mixture.

Results.

1. No mildew appeared on the fruit of any of the sprayed plants.
2. Plants treated with the Bordeaux mixture had healthier foliage and retained it longer than those treated with Potassium Sulphide, or Ammoniacal Copper Carbonate.

It should be explained, however, that the dropping of the foliage was due in a great measure to the presence of the "shot hole" fungus (*Septoria ribis*), a disease which appeared to yield more readily to the Bordeaux treatment than to the other fungicides.

The experience of a number of correspondents on this subject has been very interesting, and I append an instructive letter from Mr. W. W. Dunlop, formerly secretary of the Montreal Horticultural Society.

OUTREMONT, 9th November, 1892.

DEAR SIR,—In accordance with your request, I send some notes of my experience during the past season in spraying, for the prevention of gooseberry mildew. I

have some twenty English varieties, planted five years ago, and previous to this summer have perceived no traces of mildew on any, with the exception of the Industry. The fruit of this variety has been more or less affected each year and offered me the past summer an opportunity to test the efficacy of the fungicides, recommended in your bulletin. Before the blossoms had fallen, and while the fruit was just forming, I examined my bushes and found that the Industry was already badly attacked. I was surprised at this early development of the fungus, as my previous experience had not led me to expect it until the berries were of a much larger size. Spraying was at once commenced with Potassium Sulphide, one pound to fifty gallons, and carbonate of copper, two ounces (dissolved in one quart of ammonia) to twenty-five gallons of water. As the weather was threatening, only forty bushes were treated the first day, and frequent rain prevented the treatment of the others till some days later. As soon as the weather became settled, the whole of the bushes received two more sprayings at intervals of a week, and I was soon able to perceive with what result.

Both the solutions used appeared to have hurt the foliage to a certain extent, causing in some cases a loss of from 20 to 30 per cent of same, which resulted in a diminished size of the fruit. The progress of the mildew on the bushes first treated was arrested to such an extent that about 90 per cent of the first of these was marketable. There was little difference between those treated with the Potassium Sulphide and the carbonate of copper solution.

The fruit on the bushes treated at a later date, was a total loss.

The injury to the foliage I attribute to two causes. Firstly, a too liberal use of the solution, which was applied with an instrument not having sufficient force to form a good spray and the bushes were thus drenched, not sprayed. Secondly, the application of the fluid to the underside of the leaves which are probably more sensitive than the upper or glazed surface. As it appears necessary, however, to spray the leaves from under to get at the fruit, I am under the impression my solutions were too strong.

From the above practical test, I have been led to the following conclusions:—

1st. That the application of either of the above mentioned fungicides of a proper strength, and before the mildew has developed promises to be attended with success.

2nd. That after the mildew has attained a certain stage of development, the fungicides mentioned have no power to arrest its progress.

Trusting that the experiments now being conducted by yourself and others may lead us again to the successful cultivation of this fine fruit, the English gooseberry.

I remain, yours truly,

W. W. DUNLOP.

The relative cost of Bordeaux mixture and Ammoniacal Copper Carbonate have already been compared and it only remains to add, Potassium Sulphide can usually be purchased at from 30 to 40 cents per pound.

GRAPE MILDEW AND ANTHRACNOSE.

Two diseases of the grape are more or less prevalent in this vicinity.

1st. Grape mildew (*Peronospora viticola*).

2nd. *Anthracnose* or Bird's-eye rot (*Sphaceloma ampelinum*).

They have both been already referred to in the annual reports of the Horticulturist.

As pointed out in the past, No. 1 is amenable to the Ammoniacal Copper Carbonate treatment. The Farm vineyard was sprayed with this fungicide the past season, except three vines each of a few varieties which are peculiarly subject to mildew. These were reserved to compare the efficacy of dilute Bordeaux mixture and Ammoniacal Copper Carbonate. The vines were sprayed three times, the first application being made on May 18th, the second on June 10th, and the third on July

18th. In the case of Noah and Pearl, which in the past have been most seriously affected, the results of the treatment were as follows :—

Noah	Dilute Bordeaux mixture,	1 vine,	11 lbs. grapes.	
	Am. copper carb.,	1 do	18	do
	Untreated,	1 do	$3\frac{1}{2}$	do
Pearl	Dilute Bordeaux mixture,	1 do	4	do
	Am. copper carb.,	1 do	$3\frac{1}{4}$	do
	Untreated,	1 do	$\frac{1}{2}$	do

2nd. (*Sphaceloma ampelinum*) " *Bird's-eye rot*," when applied to the fruit, and " *Anthracnose*," when applied to the vine. The attention of grape growers is again drawn to this fungus, not with the object, I regret to say, of reporting a successful treatment of the disease, but to give such a description of its outward appearance and method of attack as will be of assistance to growers in identifying it. In my report for 1891, I said: " Treatment was commenced this fall by carefully burning all rubbish and trimmings, and spraying one half of the vines with a strong solution of Copper Sulphate, and the other half with Iron Sulphate. Next spring, on the vines being uncovered they will be again treated with the copper and iron solution, followed by Ammoniacal Copper Carbonate."

This course of treatment was carefully followed out, but proved quite ineffectual in preventing the spread of the fungus. I shall be glad to obtain the experience of others in treating this disease.

The name *Anthracnose* is usually applied to the stage of the disease when it is attacking the growing vine. It appeared on Creveling about 1st June, in the farm vineyard this season, and soon afterwards on Lindley, Brant, Eldorado, Owasso and Massasoit.

Fig. 8.—Showing Anthracnose on cane and foliage.

Affecting the young shoots, leaf petioles and flowers clusters (see Fig. 8). In general appearance it very much resembles the anthracnose of the raspberry cane, causing the same kind of irregular pits and blotches on all green and growing parts of the vine. After its first appearance the disease spreads very rapidly, and attacking the petioles and the leaves, soon gives the vine a defoliated and unhealthy appearance. In describing the disease on the fruit I draw from Prof. Scribner's excellent work on " Fungous diseases of the Grape and other Plants." " *Bird's-eye rot* first appears as a dark reddish-brown or nearly black speck, on any part of the berry. These specks gradually increase in size to $\frac{1}{8}$ or $\frac{1}{4}$ of an inch, usually preserving a somewhat rounded outline. Their centres soon take on a grayish hue, the dark-brown colour being confined to a narrow line bordering the spots. Sometimes there appears within the dark-coloured border, a band or ring of bright red or vermillion when the spot suggests the name 'Bird's-eye-rot.' (See Fig 9.)

Figures used in illustrating this article have been kindly supplied by Prof. F. L. Scribner, Knoxville, Tenn.

Fig. 9.

"During the progress of the disease there is no general withering, or softening, or browning of the berries, but the tissues beneath the spots gradually lose their turgescence; the cells collapse and become dry and hard. In advanced stages, the berries are reduced to $\frac{1}{4}$ their original size, and usually exhibit the distinct outline of the original spots. Berries when only slightly affected may become misshapen; the parts where the spots are located having ceased to grow; or they may outgrow the effects of the disease, when the only evidence of the spots left, is a gray or brown scurf covering the surface."

"If attacked upon one side when quite small the continued growth of the healthy portion will often cause the diseased side to crack open, laying bare the seeds. The latter are sometimes pushed out by this unequal growth."

"Unlike the downy mildew or fungus of the black rot, the growth of this is limited to the outer layers of cells, developing between the cuticle and the epidermis, or just underneath the latter."

Prof. Scribner says further that: "The spores germinating upon the surface of the berry, send a germ tube through the cuticle or epidermis, beneath which the fungus vegetates for a time, developing into a kind of parenchymatous or cellular growth, which at length breaks through the epidermis. From the now exposed portions of the fungus there arise numerous short branches, called basidia, on which the spores or reproductive bodies are borne."

This more or less superficial growth would naturally lead to the conclusion, as Prof. Scribner observes, that its accessibility to remedies should render the treatment a comparatively easy task. Such however has not been my experience.

A formula for treatment quoted by Prof. Scribner as being recommended by "Le Progrès Agricole," a French agricultural journal, is as follows:—

Water	3 gallons.
Sulphate of iron	7 lbs.
Sulphate of copper	2 do
Sulphuric acid	1 gill.

This solution is to be applied to the vines two or three weeks *before* vegetation starts in the spring. A mixture of this strength and composition would probably be very injurious at any time after growth had commenced, so that in making the application a considerable degree of care and judgment should be exercised.

A system of close pruning is now being adopted on affected vines in the farm vineyard, and spraying frequently at short intervals will be resorted to next season.

Where vines are badly affected they should be rooted up and burned, as they soon become centres from which the disease spreads to other vines.

A Destructive Disease Affecting Native Plums.

(Cladosporium carpophilum, V. Thümen.)

During the past two years many complaints have been received from farmers and fruit growers with regard to a disease which has caused their native plums to shrivel and drop quite suddenly, when almost mature. In many sections during the past season the crop has been an entire failure from this cause. As the disease appears to be spreading, it would seem that in the near future, very active measures should be instituted to check its increase.

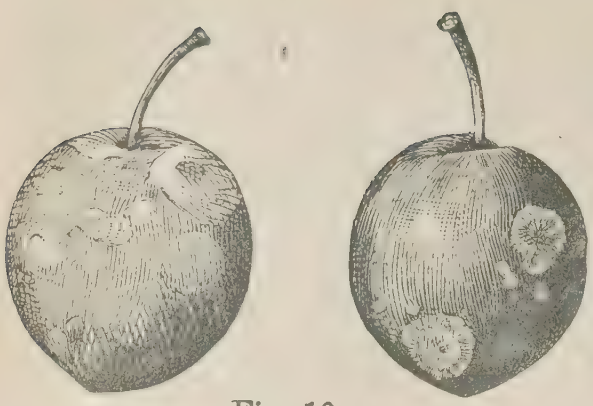

Fig. 10.

Prof. L. H. Pammel, of the Iowa Agricultural College, who has given this disease special study, has kindy supplied me with the following facts:—

"My first acquaintance with this disease as affecting our cultivated plums was in 1889.[1] The disease has appeared to be very destructive to certain varieties of plums since that time, and the fungus has been on the increase.

"This spotting (see Fig. 10) is caused by a parasitic fungus *Cladosporium carpophilum* which is frequently abundant on peaches, especially on the later varieties. So injurious is it to certain varieties that Dr. Smith[2] finds that it not only injures the appearance of the fruit somewhat, but when very abundant the flavour also. I have heard growers in Texas speak of it as nothing serious, but to my mind there is no question that it greatly lessens the crop, and also causes a cracking of the fruit as Dr. Smith finds, making it especially subject to the attacks of plum rot (*Monilia fructigena*)."

"Several other species of *Cladosporium* are troublesome to various cultivated plants."* *

"The apple scab (*Fusicladium dendriticum*) is a fungus closely related to this plum fungus[3] which without doubt will seriously threaten plum culture."

"The spots are visible in half ripe plums as small pale greenish, or yellowish patches not larger than a pin head. They increase in size, becoming in some cases half an inch across. Some of the older spots may become confluent, forming one large more or less radiating patch. Patches may also be formed in nearly mature plums. In older specimens which have been kept moist for some time the spot becomes darker in color, almost black, more irregular and somewhat raised."

"Microscopic examination of the affected portions of the plum shows a nearly colourless mycelium creeping over the surface of the fruit, or vegetating between the cuticle and the remainder of the epidermal cells. In the darker portions occur the septate hyphæ. These occasionally come through the cracks in the cuticle. In older material a dense stroma of short brown hyphæ, appears between the cuticle and cellulose layers of the epidermal cells. The small spores are oval in shape pointed at the end usually two-celled, and are borne at the end of the conidiospore, or laterally. (See fig. 11. They germinate readily when placed in water."*

Fig. 11.

"The chief injury caused by this fungus is the cracking of the plums, allowing plum rot (*Monilia fructigena*) a chance to work. The injury, however, does not, except in severe cases, extend much beyond the point of attack, and only a small number of the plum cells become brown. The fungus, no doubt, also checks the development of the plum and in the severe cases it causes a shrivelling and a subsequent dropping of the fruit. The fungus seems to occur on all kinds of American plums. Here at Ames, I have noted it on the following species and varieties: Pottawattamie (*Prunus angustifolia*), Miner (*Prunus hortulana* var. *mineri*) Maquoketa, De Soto, Rollingston, Speer, Chippeway, Black Hawk, Hen Plum (*Prunus*

1. Meeting of Iowa Academy of Sciences September 5, 1890.
2. Journal of Mycology, Vol. V., p. 32.
3. See Bailey. The cultivated native plums and cherries, Bull. 38, Cornell University, Agrl. Experiment Station, p. 54. Pammel, Jour. of Mycology, Vol. VII., p. 99.

*NOTE.—Fig. 9 shows fruiting branches of the fungus coming from the surface of the plum, somewhat irregular at the end where the spores were attached. The figure to the right shows a single fruiting branch with an attached spore at the end and several cells at the base. Greatly magnified-Original. L. H. P.

Americana), and Sloe plum (*Prunus spinosa*). Mr. F. C. Stewart reports this fungus at Greenfield, Iowa, on wild and cultivated plums, in some cases it ruined half the crop. I have also seen it very common on wild plums at Cedar Rapids, Iowa, and Mr. Stewart also found it at Marshalltown, Iowa. Mr. Geo. W. Sturtz reports it at Plainview, Nebraska, and Mr. John Wragg at Waukee, Iowa; and my friend Mr. Craig, of Ottawa, Canada, writes me that it was common in Minnesota on cultivated Cheney, De Soto. Rollingston and Speer; that it also occurs on the common wild plum and cultivated varieties in Canada; also in Virginia on *P. Americana*. It did not appear at the Experimental Farm, Ottawa, in 1891. From this it will be seen that this fungus has become widely distributed and destructive and is certainly on the increase. It did not appear to any extent this year at Ames, except upon a few Chickasaw and sloe plums, as plums fruited but little. I have not seen it attacking (*Prunus domestica*) at Ames. The *Cladosporium* has become in this section a serious enemy also to cherries, first noticed in 1891, when it destroyed from 2 to 10 per cent of the crop. Its first appearance on cherries is marked by a pale coloured spot not larger than a pin head, which increases in size, and finally is olive green in colour. As in plums a crack is frequently found extending across the patch. The cherries become also badly shrivelled in many cases besides being somewhat bitter and sour. We noticed the following varieties affected in 1891, Cerise d'Ostheim, Spate Amarelle, Shadow Amarelle, and Wagner; and in 1892 although the cherry crop was small, the disease appeared on many cherries. My assistant, Mr. Stewart, has furnished me with the following list: Lutovka, Shadow Amarelle, Schatten Amarelle, and Spate Amarelle. It will be noticed that this list only contains Russian varieties, as most of the cherries grown on the college grounds are from Russia. Early Richmond, however, growing not far from the college was not affected by the disease; it may have appeared in other places, but I have not heard of any, or at least specimens were not sent to me."

"Experiments with fungicides would have been instituted this season, but the plum and cherry crop being almost a failure, no experiments could be carried out."

"*Treatment recommended.*—As this fungus works very much in the same manner as apple scab, there is no reason why the fungicides used for that disease should not prove effective. But treatment should begin as soon as the petals have fallen, and should be continued till nearly the ripening period."

In addition to the remedies recommended by Prof. Pammel, I would suggest the use of a weak solution of Copper Sulphate, say 1 oz. in 25 gallons of water. I shall be glad to receive any additional data regarding the progress, spread, and life history of this fungus. It is of special importance to fruit growers in the Ottawa valley, where we are debarred by climatic conditions from growing many of the European family of plums bearing fruit of finer quality, but less vigorous and hardy in tree.

It may be mentioned that this is a new disease, and although it has received considerable attention from economic botanists during the last three or four years, was only described by Felix Von Thümen in 1887.

Plum Rot.

(*Monilia fructigena, Pers.*)

The appearance of this parasite on cultivated plums is too well known to need an extended description. It is not so generally understood that it also attacks cherries, apricots and peaches. In the case of early peaches, it is very destructive; a number of specimens were received the past summer, showing it to be quite prevalent in peach-growing districts. The presence of the disease is not often noticed till the affected fruit has begun to turn brown, and is covered by patches of grayish frosting. This grayish appearance is caused by numberless spores, borne upon the ends of the vegetative portion—mycelium—of the fungus which infests the tissues of the fruit. This disease also attacks the twigs and sometimes stems of bearing trees, causing a kind of twig and bark blight.

Treatment.—Owing to the method of attack, and the fact that the presence of the disease is not noticed till well established in the tissues of the fruit, early treatment is above all other considerations most essential. Prof. Bailey writing in

"Garden and Forest," says that fruit growers in the vicinity of Geneva, N.Y., secure paying results by spraying with the copper compounds. I am not aware that any experiments have been conducted in the Dominion which may be accepted as conclusive. Mr. Murray Pettit, of Winona, Ont., kindly furnishes me with his experience in treating plum rot during the past season. He writes: "The sprayed trees were Lombards, planted in orchard, alternately with apple trees. They were considerably shaded and had rotted badly the two previous seasons. This spring they again showed the appearance of rot while quite small. I at once gave them a thorough spraying with sulphate of copper, 2 oz. to 40 gallons of water. This application was repeated in six days. Both sprayings were done at the most fortunate periods with regard to rain. I had very little rot in comparison with other seasons." This, as Mr. Pettit justly remarks, is only the experience of one season, and should not be accepted as conclusive evidence of the efficacy of this remedy. I would recommend a rather stronger solution of copper sulphate than the above—say 2 oz. to 30 gallons of water.

Anthracnose of the Bean.

(*Colletotrichum Lindemuthianum Sacc.*)

Fig. 12.

The annual loss from the above cause to farmers and market gardeners in this vicinity for the past three or four years has been very considerable. The following experiments were suggested by the results of laboratory investigations conducted by Dr. B. D. Halsted. an eminent authority on fungous diseases of plants, of the State Agricultural Experiment Station at New Brunswick, N.J. Dr. Halsted states that the fungus "most frequently attacks the pods of the bean, when they are only partially grown, and causing the formation of deep dark pits, materially lessens the yield of salable beans from the field infested. Fig. 12 shows seed beans and a young bean plant attacked with anthracnose. The disease spreads rapidly from pod to pod in the market place, as has been shown by repeated inoculations in the laboratory, where under the most favourable conditions, a spot may be established upon an otherwise healthy plant in thirty-six hours." (See annual report, N. J. Expt. Station, 1891, p. 284.) Acting on the belief that the seed beans themselves furnished the principal means for the perpetuation of the anthracnose from one season to another, samples of infested seed were soaked in copper solutions of varying strength. Plants raised from soaked seed showed very little anthracnose in comparison with other seed untreated.

Dr. Halsted obtained the best results from seed soaked for one hour in a solution of "three ounces of Copper Carbonate and one quart of ammonia to 4½ gallons of water."

The following experiments were designated to show, (1) the effect on the germinating power of seed beans of soaking them in solution of copper carbonate and copper sulphate; (2) to test the efficacy of soaking seed beans in the above solutions to prevent "anthracnose" or "pod spotting."

The experiment comprised the treatment of 48 samples, each containing 100 seed beans. These were sown in rows, each 25 feet in length. When the pods were fully formed but yet green, they were picked and sorted, the first grade consisting of *sound pods*, the second of pods *slightly spotted*, and the third of those which were *badly spotted*.

The subjoined tabular statement gives the solutions used; the length of time which each sample was soaked; and the result of each treatment.

Note.—I am indebted to Dr. D. B. Halsted for the use of Fig. 12.

SEED Beans treated for Anthracnose.

Variety.	Solution used.	How long soaked.	Germinated.	Healthy pods.	Slightly spotted pods.	Badly spotted pods.	Average of healthy pods.	Average germinated.
	Sulphate of Copper.		per ct.	per ct.	per ct.	per ct.	per ct.	per ct.
Mohawk	1 oz. to 1 gall.	½ hour.	80·	75·	17·5	7·5		
Long Yellow	1 " 1 "	½ "	90·	56·93	34·09	9·09		
Flageolet	1 " 1 "	½ "	56·	75·	15·	10·	64·9	61·2
Golden Wax	1 " 1 "	½ "	20·	52·68	26·31	21·01		
Mohawk	1 " 1 "	1 "	70·	49·51	29·70	20·70		
Long Yellow	1 " 1 "	1 "	84·	75·	15·	10·		
Flageolet	1 " 1 "	1 "	40·	80·1	13·3	6·6	60·8	54·3
Golden Wax	1 " 1 "	1 "	25·	38·8	29·	32·		
Mohawk	½ " 1 "	½ "	60·	80·	20·	....		
Long Yellow	½ " 1 "	½ "	92·	65·	30·	5·		
Flageolet	½ " 1 "	½ "	65·	65·76	10·10	14·14	65·2	58·
Golden Wax	½ " 1 "	½ "	15·	50·1	33·3	16·6		
Mohawk	½ " 1 "	1 "	73·	80·14	19·86	....		
Long Yellow	½ " 1 "	1 "	81·	79·61	12·93	7·46		
Flageolet	½ " 1 "	1 "	48·	77·20	12·86	9·94	69·9	60·2
Golden Wax	½ " 1 "	1 "	40·	43·	23·8	34·2		
Mohawk	Untreated	....	....	35·16	43·63	21·21		
Long Yellow	"	....	95·	62·97	22·22	14·81		
Flageolet	"	....	75·	41·15	27·21	37·64	43·7	84·
Golden Wax	"	....	82·	35·9	23·9	20·9		
	Ammoniacal Copper Carbonate.							
Mohawk	1 oz. to 1 gall.	½ "	75·	78·96	13·15	7·89		
Long Yellow	1 " 1 "	½ "	95·	33·66	46·23	20·10		
Flageolet	1 " 1 "	½ "	75·	68·	16·	13·00	58·79	77·5
Golden Wax	1 " 1 "	½ "	65·	54·56	22·72	22·72		
Mohawk	1 " 1 "	1 "	83·	88·88	11·11	·01		
Long Yellow	1 " 1 "	1 "	86·	80·	17·14	2·86		
Flageolet	1 " 1 "	1 "	63·	71·44	17·85	10·71	71 68	74·22
Golden Wax	1 " 1 "	1 "	65·	46·43	25·	28·57		
Mohawk	1½ " 1 "	½ "	76·	89 86	7·83	2·30		
Long Yellow	1½ " 1 "	½ "	91·	50·76	28·92	20·30		
Flageolet	1½ " 1 "	½ "	80·	61·04	13·14	25·82	64·6	73·75
Golden Wax	1½ " 1 "	½ "	48·	57·78	20·	22·22		
Mohawk	1½ " 1 "	1 "	75·	95·	5·	....		
Long Yellow	1½ " 1 "	1 "	82·	80	15·	5·		
Flageolet	1½ " 1 "	1 "	66·	80·97	14·28	4·75	79·1	73·13
Golden Wax	1½ " 1 "	1 "	60	60·61	24·24	15·15		
Mohawk	2 " 1 "	½ "	45·	78·97	17·85	3 57		
Long Yellow	2 " 1 "	½ "	92·	62·5	31·25	6·25		
Flageolet	2 " 1 "	½ "	50·	90·52	6·32	3·16	72·6	51·3
Golden Wax	2 " 1 "	½ "	20·	58·54	9·51	21·91		
Mohawk	2 " 1 "	1 "	33·	85·53	14·47	....		
Long Yellow	2 " 1 "	1 "	85·	82·06	10·25	7·69		
Flageolet	2 " 1 "	1 "	35·	84·	12·	4·	81·6	54·2
Golden Wax	2 " 1 "	1 "	65·	75·1	15·6	9·3		
Mohawk	3 " 1 "	½ "	30·	96·	4·	....		
Long Yellow	3 " 1 "	½ "	89·	67·85	25·	7·14		
Flageolet	3 " 1 "	½ "	46·	85·72	7·14	7·14	75·4	45·
Golden Wax	3 " 1 "	½ "	15·	52·19	26·08	21·71		
Mohawk	3 " 1 "	1 "	32·	92·42	6·06	1·51		
Long Yellow	3 " 1 "	1 "	83·	84·70	9·18	6·12		
Flageolet	3 " 1 "	1 "	18·	80·1	13·3	6·6	82·8	43·1
Golden Wax	3 " 1 "	1 "	40·	74·1	17·3	8·6		

SUMMARY OF RESULTS.

Ammoniacal Copper Carbonate.—1. The best results with regard to freedom from spot were often correlated with a low germinating percentage.

2. The results in almost every case were favourable to the Ammoniacal Copper Carbonate treatment.

3. Seed soaked for half an hour in 1 oz. to 1 gallon of water gave the lowest percentage (58 per cent) of healthy pods, and the highest (77 per cent) germinating percentage.

4. Seed soaked for one hour in a solution of 3 oz. to 1 gallon gave the highest percentage (82 per cent) of healthy pods, and the lowest (43 per cent) germinating percentage.

5. As a general rule the percentage of healthy plants was in inverse ratio to the percentage of germination; showing the fungicidal effect of strong solutions, as well as their weakening effect on the germinating power of the seed.

6. The most satisfactory results were obtained by soaking the seed for one hour in 1½ oz. of copper carbonate, dissolved in a pint of ammonia, and diluted with water to one gallon. This gave 79 per cent of healthy plants, with a germinating power of 73 per cent, as against 43 and 84 per cent respectively for the untreated.

Copper Sulphate.—1. The best results were obtained by soaking the seed for one hour in a solution of ½ an oz. to 1 gallon of water, which gave a return of 69 per cent of healthy pods; vitality of seed, 60 per cent.

2. The average results were considerably lower than with the ammoniacal carbonate of copper treatment.

CONCLUSIONS AND RECOMMENDATIONS.

1. Seed beans can be treated for anthracnose cheaply and advantageously by soaking in copper compounds.

2. Soak the seed beans for one hour before planting, in a solution made by dissolving in a pint of ammonia 1½ oz. of carbonate of copper, and diluting with water to one gallon.

3. When carbonate of copper is not easily obtained, use copper sulphate (blue vitriol) one-half ounce to each gallon of water.

AN EXPERIMENT SHOWING THE EFFECT OF ADDING LIME TO INSECTICIDES AND FUNGICIDES.

It has been claimed that the addition of lime to spraying compounds containing arsenites has allowed of stronger applications of the latter being made than could otherwise be used without danger of injuring the foliage. This assumption, apparently well founded, has been the means of extending the use of Paris green and Bordeaux mixture—which is composed in part of lime—as a combined insecticide and fungicide.

The foliage of stone fruits, as plums and cherries, has been found to be more susceptible to injury from Paris green than the foliage of apple trees. The experiment here outlined was designed to throw light on the following points.

1. The possibility of applying together Paris green and Ammoniacal Copper Carbonate by the addition of lime, without injury to the foliage of fruit trees.

2. The maximum strength which Paris green can be safely applied to the different varieties of stone fruits by the addition of lime.

Some of the detailed results are set forth in the accompanying tabular statement.

FUNGICIDES and Insecticides used and Varieties sprayed.

	Formulæ.	Cherries.			Plums.					Pears.	
		Early Richmond.	Ostheim.	Reine Hortense.	De Soto.	Early Red.	Lombard.	Duane's Purple.	Glass Seedling.	Lutovka.	Double Beurré.
1	Paris Green, 1 oz.; Lime, 1 lb.; Water, 25 galls.	No injury.	No injury	....	No injury.........	No injury	Very slight injury...	No injury			
2	Paris Green, 2 oz.; Lime, 2 lbs.; Water, 25 galls.	No injury.	No injury	No injury	Very slight injury.	No injury	Slight injury.......	....	Very slight injury.	Slight injury	
3	Paris Green, 3 oz.; Lime, 3 lbs.; Water, 25 galls	No injury.	No injury	....	Slight injury......	No injury	Considerably injured	....	Slight injury......	Slight injury	No injury

APPLES.

	Formulæ.	Duchess.	Wealthy.	Tetofsky.	Yellow Transparent.	McMahon's White.	Canada Baldwin.	Northern Spy.
4	Copper Carbonate, 2 oz.; Ammonia, $1\frac{1}{2}$ pts.; Paris Green, 2 oz.; Lime, 1 lb; Water, 25 Galls.	No injury.	No injury	No injury......	No injury.........	No injury..		
5	Same as No. 4, but without Lime	Very slightly injured..	Very slightly injured..	No injury......	Slightly injured...	No injury...	Slight injury....	Slight injury
6	Copper Carbonate, 3 oz.; Ammonia, 1 quart.; Paris Green, 2 oz.; Lime, 1 lb.; Water, 25 galls.	No injury............	No injury............	No injury.......	Slight injury......	No injury...		No injury
7	Same as No. 6, but without Lime.	Slight injury.........	Considerable injury...	Slight injury....	Slight injury......	No injury...	Slight injury....	

Two sprayings were made in each case, about a week apart during the second half of June, when the leaves had obtained full size and while growth was still taking place. The results obtained point to the following conclusions :—

1. That the foliage of some varieties is more susceptible to injury from the application of fungicides and insecticides than others.

2. That in the case of apples, 2 oz. of Paris green can be safely added to the ordinary formula of Ammoniacal Copper Carbonate—3 oz. of Copper Carbonate to 25 gallons—when lime at the rate of 1 lb. to 25 gallons is added to the mixture.

3. That the benefit arising from the addition of lime to mixtures of Paris green and water (see table, mixtures No. 1, 2 and 3) is not so apparent when used for insecticidal purposes on plums and cherries, as in the case of combined fungicides and insecticides (see mixtures Nos. 4 and 5 in table.)

4. That the Lombard plum is exceedingly susceptible to injury; and in spraying this variety for curculio, Paris green, stronger than 1 lb. to 400 gallons of water should not be used. Other varieties do not appear to be equally susceptible to injury.

It would appear from the foregoing that the foliage of some varieties of cherries is not injured when sprayed with Paris green with the addition of lime, using the former as strong as 1 lb. to 125 gallons. This is much stronger than necessary however.

DISTRIBUTION OF HARDY ORNAMENTAL EVERGREENS, AND DECIDUOUS TREES, INCLUDING CUTTINGS OF POPLARS AND WILLOWS.

The work during the year in this branch has consisted in making to Manitoba and the North-west a distribution of a limited number of varieties of the hardiest known native or foreign ornamental shrubs and evergreen conifers; also an assortment of cuttings of European willows and poplars, which by reason of their hardiness and rapidity of growth seemed specially adapted to the needs of the North-west.

The primary objects of the distribution were as follows :—

1. To test the relative adaptability of certain ornamental shrubs and evergreen trees to the climate and soil of Manitoba and the North-west; to encourage and assist settlers who wished to beautify, as well as shelter their homes.

2. To provide farmers in the prairie region with the means of obtaining in a short time, wind-breaks for stock yards and gardens, in addition to shelter belts, which are of great service in growing from seed, other varieties of forest trees less vigorous. The poplars and willows, it is hoped may give valuable assistance towards fulfilling these desirable ends.

Ornamental Shrubs and Conifers.

Of these, there were 983 packages distributed, which were made up of plants grown at the Central Farm. Manitoba received 550 packages; 375 were sent to the North-west Territories, and 58 to other provinces. Each package contained :—

30 Riga pine, *Pinus Sylvestris* var. *Rigaensis.*
3 Austrian pine, *Pinus Austriaca.*
1 Scotch pine, *Pinus Sylvestris.*
5 Norway spruce, *Picea excelsa.*
2 Black walnut, *Juglans nigra.*
1 White lilac, *Syringa alba.*
1 Common barberry, *Berberis vulgaris.*
1 Josikea lilac, *Syringa Josikea.* Alternated with,
1 Sweet briar, *Rosa rubiginosa,* and
1 Caragana, *Caragana arborescens.*

The Riga pines comprising the largest share of these packages were well grown stocky plants raised from seed obtained in 1889 by Prof. Saunders from Russia, which were collected in one of the Government forests situated north of Riga. To facilitate early and prompt shipment in the spring the young trees were taken up

the fall previous, and stored in an improvised cellar or cave. They were given the best care possible, under the circumstances, and were sent out apparently in fair condition. In nearly every instance they arrived at their destination in a more or less mouldy state, and consequently very few survived.

It would appear that the germs of fungus growth were present in an incipient stage, when the trees were taken from the cellar in the spring, and only needed the conditions offered by the moist confinement of the mail package to spread the infection. The loss of a large portion of these desirable young trees is much to be regretted.

From reports I gather that most of the shrubs have done well.

Poplars and Willows.

Of these there were distributed 918 packages; 280 were sent to Manitoba and 638 to the Territories. In the making up of these, cuttings of the following varieties were used, from 75 to 100 composing each package.

Poplars.

Populus certinensis.
" nolesti, Riga.
" nolesti.
" Lindleyana.
" pyramidalis.
" bereolensis.
" Simonsii.
" Caroliniana.
" No. 10.
" No. 11.
" Petrovsky.

Willows.

Salix Voronesh.
" laurifolia (from France.)
" acutifolia.
" Wisconsin Weeping.

Appropriate directions for planting and the after care, were mailed to each recipient of the cuttings and shrubs.

These cuttings are of promising hardy varieties which have been introduced from East Europe within the last few years.

They have been selected for the reason that they have proved hardy on the Experimental Farms at Brandon, Man., and Indian Head, N.W.T., and are believed to be specially adapted to the requirements of those farmers residing on the plains of Manitoba and the North-west.

The ease and rapidity with which they can be multiplied gives them additional value. From their quick growth they will be found most useful in providing the shelter needed for starting the cultivation of less hardy but more enduring kinds, of slower growth.

The value of this work will be much enhanced if accurate records are kept of each variety by the individuals receiving them. The close resemblance of many of the poplars will necessitate careful labelling. Reports will be expected when sufficient time has elapsed and experience gained, to give value to the conclusions reached.

Cuttings may be taken from the young trees at the close of the second season's growth. These should be buried in the ground and protected from severe frost during winter. They may be planted the following spring four feet apart, with a view to the formation of shelter belts. With a slight degree of care and attention, a large plantation can thus be readily secured.

That this line of work is meeting with the hearty approval and co-operation of the farmers of Manitoba and the North-west Territories, is demonstrated by several hundred voluntary reports which have come from the recipients of the *Forest* and

Fruit trees distributed during the past three years. The following letters are fair examples of the many which have been received, and illustrate some of the difficulties and successes experienced by the North-west farmer in growing trees.

CLARE, ASSA., N. W. T., 2nd May, 1892.

DEAR SIR,—I beg leave to report on the forest tree seedlings, and fruit trees which I received from the Central Farm last spring. The two Saccharine apples came out well in spring. I tied a bundle of straw round them for a protection at first; they grew about two feet last season. The two White Grape currant bushes died. But one of the Red Dutch currant wintered without protection and is looking very healthy. The Duchess apple trees are both dead. The rhubarb never came up, but the asparagus did very well, also the rose bush. As for the forest tree seed you sent me I am satisfied I have a return of 90 per cent of young trees. The Russian mulberry is a total failure with me.

In regard to the Houghton gooseberry it will be a success in this country if it is protected in winter with something which will retard early growth in the spring. Of the forest trees received in 1891, there are:—

10 Green ash, living.
10 White ash "
25 Box elder "
2 Soft maple, growing well.
20 American elm "
6 Manitoba elm "
2 Black cherry, both dead.
2 Black walnut "
2 Honey locust "
5 White birch, growing well.
3 Canoe birch "
4 Riga Pine, dead.
4 Norway spruce, 3 growing.
1 Arbor vitæ, doing well.

The cherry pits you sent me have not germinated yet, but may sprout this spring. This has been a hard winter to raise fruit trees. The jack rabbits if not fenced out, make serious depredations in our small fruit plantations. We have not been successful so far with strawberries on account of the drouth. I am afraid they will be difficult to grow successfully. I am trying grape vines this spring, and 25 red and white currants. I put out 24 improved currants last spring and I only lost four of them. I am also trying to grow crab apples from seed.

Yours truly,
JOHN BEGGS.

YORKTON, ASSA., NORTH-WEST TERRITORY,
20th September, 1892.

SIR,—Last winter I sent you a report on the seedling forest trees I had received from the Experimental Farm, and promised to give you a further report this season. I am sorry to say that the majority of them were winter killed. The following is a list of the survivors, which have all made good growth this season, and will, I hope, now stand the climate:—

Box elder.. 2
White ash.. 4
Green ash.. 2
Manitoba elm.. 10
the full number received of this variety.
American elm.. 1
Mountain ash.. 2
White birch.. 5
also the full number received of this variety.
Norway spruce.. 2

I also received a bag each of box elder (Manitoba maple), and ash seeds, which I sowed early in May, 1891. The maples came up early, and made an average growth of about eighteen inches; none of them were winter killed, and they now stand from three to four feet high. The ash seed was late in coming up, and only about two-thirds germinated and made little growth; but this year in spite of terrible drought the young trees have done well. None were winter killed. I also received a packet of rhubarb and asparagus seed. From the rhubarb seed I got 14 plants, which I transplanted this spring as soon as they began to show above ground, and last week I pulled stalks from these seedlings measuring 4½ inches in circumference and 14 inches in length.

The asparagus did very well, and this spring I set out two beds, thirty feet long, three rows of plants to each bed, set a foot apart each way; and then I had enough plants to give a neighbour sufficient for a large bed. It has made a strong, healthy growth this season in spite of the drought.

Of the trees received this spring I have but a poor report to make, as they were in very bad shape when they arrived, only one Norway spruce, and one Riga pine survived.

Of the shrubs "Caragana" has made a marvellous growth.

"Josikea lilac" did fairly well, white lilac and Barberry both died.

With the poplar and willow cuttings received this spring, the result in a few instances has been very good; in other cases not so good, and with some a complete failure.

The following is a list of the cuttings that grew:—

Populus bereolensis	7	very strong.
Populus certinensis	5	" "
Salix Voronesh	17	very varied in growth.
Salix acutifolia	1	very strong.

At present all the cuttings have several shoots; in some cases they are over eighteen inches in length, and I should like to know if all the shoots should be trimmed off but one.

[If needed for a garden wind-break it is advisable to grow them in bush form, otherwise trim to a single stem.—J. C.]

Yours respectfully,
CHAS. E. F. LOWE.

BEECHEAD FARM, VIRDEN, MAN.,
Sec. 6, 75 R, 16 W.,
Ninette P. O., Man.

SIR,—Enclosed you will find in a tabular form the result of trial of forest and fruit trees received from the Experimental Farm at Ottawa, spring, 1890. The result is not very satisfactory, owing to the dryness of the early part of the summer of 1890, also the early fall frosts coming before the young wood was matured. This is a great drawback even to the hardiest of trees in this vicinity.

Box elder, made good long shoots, slightly killed back.

White elm—made good shoots, which were killed back to previous years' wood.

White and green ash— do do

Houghton gooseberries—made, fair shoots, killed back to old wood.

Cuthbert raspberry has a dozen canes from 15 to 20 inches high.

Butternuts, Black walnut, Kentucky coffee tree, and Mulberries, may not survive this winter, as the growth is weakly.

Duchess apple, Red and White currants, are the only things that stood the winter without injury.

I received in spring of 1889 a parcel of Butternuts, none of them have germinated yet. I planted them according to instructions; I also received a parcel of box elder seed this last spring, 1891, and the plants have made but short growth. I have planted box elder seed for several seasons, and it does very well if the seed has

been thoroughly ripened before the fall frosts. I also grew Mulberries and butternuts some years ago, kept them three winters and then lost them.

I desire to lend a helping hand in the matter of tree culture in this North-west country. Until we get shelter belts of the more hardy varieties of forest trees, those less hardy will not be a great success, unless in the more favoured situations.

TABULAR STATEMENT.

—	Planted, Spring 1890.	Alive, Fall 1890.	Alive, Fall 1891.
Box elder	26	20	20
White elm	24	18	18
White ash	10	3	3
Green ash	10	6	3
Soft maple	5	2	
Hard maple	2		
Black walnut	5	4	1
Cotton wood	3	1	1
Honey locust	2	2	
Black locust	2	2	
Kentucky coffee	1	1	1
Apple, Tetofsky	1		
do Duchess	1	1	1
Gooseberry, Houghton	2	2	2
Currant, Red Dutch	2	1	1
do White Grape	2	1	1
Black raspberries, Mammoth Cluster	2		
do Shaffers	2		
do Gregg	2		
Raspberries, Cuthbert	2	1	1
do Hansell	2		
do Turner	2		
Butternut	2	2	2
Red cedar	1		
Russian mulberry	5	3	2
	118	70	57

Soil, black loam with yellow clay subsoil; ground level; a little shelter from east and north, none from west.

Yours respectfully,
JAMES BELL.

NELSON, MAN., Nov. 29th, 1892.

DEAR SIR,—I herewith submit to you a report on the growth of the fruit and forest trees you sent me last spring. I am greatly delighted with the growth of the poplar and willow cuttings. Pop. Lindleyana made the fine growth of over 5 feet, from a cutting in one year. Pop. nolesti, certinensis, pyramidalis and nolesti Riga all made a fine growth of from three to four feet. Only four died out of the thirty received. I am equally pleased with the willows, all of the forty Voronesh but one, grew three to four feet; of Wisconsin weeping, only one is alive; Salix acutifolia all alive, growth three to four feet. Laurifolia, I rank among the ornamentals, the foliage is really pretty. None of the Evergreens have shown any signs of life; the foliage appeared to be mildewed when they arrived here. The White and Josikea lilac are firmly established; the Sweet Briar grew well from the first and was much admired. Of the fruit trees sent I am sorry to report the death of the Lutovka Cherry. Bessarabian looks fine and has made a growth of nine inches. The Baba Pear was sickly all summer, and I have my doubts about it growing next spring. Apple trees are all alive and went into winter quarters with well ripened wood, Hare Pipka and Blushed Calville best in that respect. Sugar Sweet made the most vigourous growth, twenty-five inches; Saccharine four inches. Altogether they are a fine, healthy lot of trees and I am proud of them.

Yours respectfully,
A. P. STEVENSON.

SUMMARY.

From the experience gained thus far in testing the adaptability of varieties of forest trees, and the best means of obtaining shelter belts in the North-west, I deem it advisable to make the following recommendations :—

1st. Rely mainly on native trees.

2nd. Grow these from seed obtained from the nearest point to the intended place of planting.

3rd. Procure when possible cuttings of Russian poplars in the fall, bury them in the earth over winter; setting them deeply in the spring in mellow ground. These are for rapid growing wind breaks and for fuel.

4th. Having a wind break of Manitoba maple, ash, elm, or Russian poplar, begin planting such hardy small fruits as red and white Dutch currants, not omitting the native black currant, Houghton gooseberry, Philadelphia and Turner raspberries; and if the grower is prepared to give special attention in the matter of winter protection and supplying the necessary amount of moisture in summer, plant Captain Jack and Crescent strawberries. With irrigation and protection from the winds these can be grown successfully.

REPORT OF THE CHEMIST.

(FRANK T. SHUTT, M.A., F.I.C., F.C.S.)

OTTAWA, 14th January, 1893.

WM. SAUNDERS, Esq.,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith the sixth annual report of the Chemical Department of the Dominion Experimental Farms.

As the relation of the science of chemistry to agriculture becomes better known throughout the Dominion, the value of chemical data is more and more appreciated. The publication and dissemination of reports and bulletins (which are now largely copied by the Canadian press) and the yearly addresses delivered at the agricultural conventions and farmers' institutes, have served to awaken a fresh interest in farming throughout the length and breadth of the land. As a natural result of this awakening—of this desire for more exact knowledge regarding the composition and value of soils, fertilizers, cattle foods and dairy products, the demands made upon this department have greatly increased over those of previous years.

This is most encouraging to myself and must be gratifying to those who inaugurated our Experimental Farm system, but at the same time it points emphatically to the necessity of enlarging our staff of skilled workers at no distant date, if the chemical branch of agricultural investigation is to keep pace with the requirements of our farming interests.

As an instance of the growing demands made upon our time, I would state that nearly 1,500 letters have passed between myself and correspondents during 1892. Many of the enquiries (which relate to all the branches of agriculture) entail analytical work, and others require answers that necessitate considerable research. The preparation and delivering of addresses at various conventions held by dairymen and fruit-growers, as well as at ordinary farmers' institutes, consume much time, this branch of my work having greatly developed of late.

Our work, otherwise, consists of experimental research in connection with the Farm system and the solution of such other problems suggested by farmers that are considered of sufficient importance to merit our attention and study.

Besides the matter here reported upon, there are several lines of research still in progress, chief among which may be mentioned the analysis of Canadian grasses and fodder plants and the amelioration of the alkaline soils found in parts of Manitoba and the North-west Territories.

The present report, for convenience of reference, is divided into three parts, as follows:—

PART I. FODDERS.—Complete analyses of thirty-seven fodders made during the year are given, and the relative values as feeding stuffs added. The list comprises both "coarse" or "bulky," and "concentrated" foods. Under the former the nutritive value of beans and sunflowers is reported upon. This will be especially interesting at the present time, in view of the proposed introduction of these crops to be used in conjunction with Indian corn in the silo. In the "concentrated" fodders are to be found most of the grains and milling products used on the farm, and in this connection particular attention may be called to the value of frozen wheat as determined by chemical analysis.

Part II. FERTILIZERS.—The first chapter treats at some length of farm-yard manure, and details some experiments regarding loss of fertilizing constituents on exposure.

Samples of superphosphate of lime, bone meal, bone char screenings, fish manure, and codfish bone, have all been analysed and are here reported upon. Several specimens of marl and of soot have also been examined, and their values as fertilizers are here given.

PART III. MISCELLANEOUS EXPERIMENTS AND ANALYSES.—The results of some original work in composite testing by the Babcock method, whereby the amount of labour and time may be materially lessened, are here stated. As there is now a general desire to adopt the basis of fat content for the valuation of milk, the consideration of the modification here suggested will be of peculiar interest and importance to farmers and dairymen.

The analyses of well waters from farmers' homesteads here find a place, and attention is again called to the necessity of a pure water supply on the farm.

Further experiments in the prevention of smut in wheat are detailed. The results obtained corroborate, on the whole, those reported in 1890 and 1891. Further research as to the effect of lime with bluestone has also been made. Our conclusions appear in tabular form.

The use of corrosive sublimate (mercuric chloride) in dilute solutions as a fungicide and the results of some experiments in the preservation of potatoes by 2 per cent sulphuric acid conclude this part.

I again desire to acknowledge the valuable help rendered by the assistant chemist, Mr. Adolph Lehmann, B.S.A., and, by my thanks here tendered, wish to give public recognition to his ability and industry. His devotion to the work of the department and the skill he has displayed have alone enabled me to complete successfully the chemical operations, the results of which are given in the present report.

I have the honour to be, Sir,

Your obedient servant,

FRANK T. SHUTT,
Chemist, Dominion Experimental Farms.

Chemical Laboratories,
Central Experimental Farm,
Ottawa.

PART I.

FODDERS.

Cattle foods, according to their composition, fall into two great classes, between which, however, there is no fixed line of demarcation.

The first class includes the coarse or bulky fodders. These are mainly the following :—

Grass and hay, corn fodder and ensilage, straw and roots. Many of these possess a large percentage of water—as in the case of grass, ensilage and roots—and are further characterized by their "dry matter" being comparatively poor in albuminoids and fat. In many, also, the fibre amounts to one-half, or even more, of the dry matter.

The second class comprises the concentrated fodders. Chief among these are the seeds of the cereals and leguminosæ (oats, barley, wheat, peas and beans) and the bye-products of milling and other industries, such as bran, shorts, oil cake, the refuse from starch factories, brewers' grains, &c. They are rich in albuminoids, fat and carbohydrates, and, as a rule, do not contain much fibre nor water, and hence serve to supply in a ration those elements of nutrition which the coarse fodders possess only in small quantities.

The first mentioned fodder crops are usually raised by the farmer in sufficient quantities for his own stock, while, for many reasons, it often happens that a large proportion of the concentrated feed stuffs must be purchased, and this is more especially the case with the dairyman and stock raiser. Since the coarse fodders, though serving a very important function in all rations, are not economical nor efficient to

feed alone, but must be supplemented by those of a richer character, a knowledge of the composition of fodders, and of the relative value for feeding purposes of their several constituents becomes necessary. This is the more evident as the market price of the concentrated fodders fluctuates, and is based, not upon their feeding value, but upon the relation of supply and demand.

In former reports we have dwelt at length upon the functions of the different food constituents in the animal system; it will therefore suffice now to briefly state the more essential facts in this connection.

Albuminoids.—A collective name applied to the nitrogenous organic substances. They are the most valuable of all fodder constituents. They are essential to the formation of muscle, cartilage and the tissues generally, and of the animal fluids, blood and milk. Though their principal office is repairing waste and making new tissue, they also serve to develop heat and energy when fat and the carbo-hydrates are lacking or in insufficient quantities. Whether animals are laying on flesh, producing wool or milk, or working, a supply of albuminoids is necessary, and experience has shown that economic feeding chiefly consists in obtaining them at a minimum cost and feeding them in sufficient quantities.

Fat.—This ingredient has a high nutritive value, and in this respect ranks next to the albuminoids. By its combustion it generates the greater part of the heat of the body. Further, it is readily transformed into fatty tissue in the animal.

Carbohydrates—Consist of sugars, starch, gums and allied substances, and form a large percentage of the organic matter of plants. They are readily assimilated and oxidized in the animal system, producing much heat and energy.

Fibre.—Compared with the constituents already discussed, fibre has a low nutritive value. It forms the woody parts of the stems and leaves of plants and of the hull or husk of seeds. As a rule the fibre becomes harder and less digestible as the plant approaches maturity.

Ash or Mineral Matter.—This contributes to the formation of bone and supplies the tissues throughout the body with the minute quantity of mineral matter they require. It also replaces those saline substances daily excreted.

The question of economic feeding is intimately related to that of maintaining and increasing the fertility of the soil. This becomes evident when we remember that the greater portion of the fertilizing elements (chiefly nitrogen, potash and phosphoric acid) of a food, are returned in the manure. It is for this reason that a ration with a high percentage of albuminoids gives a manure rich in nitrogen and *vice versa.* Unless manure or artificial fertilizers are bought, a large percentage of the produce should be fed on the farm. The soil may then be expected to yield lucrative crops and at the same time not deteriorate.

Again, economic and efficient feeding can only result from the application of a knowledge of the composition and feeding value of our principal fodders and a due consideration of their market prices, which latter it may be added is not always in accord with nutritive value. It is to afford this knowledge that during the past year some of the principal fodders, both "coarse" and "concentrated," have been examined in our laboratories—the results of which are set forth in the following table. The constituents are recorded in percentages and in pounds per ton.

Analyses of Fodders, 1892.

	Fodder.	Locality.	Water. Per cent.	Water. Lbs. per ton.	Albuminoids. Per cent.	Albuminoids. Lbs. per ton.	Fat. Per cent.	Fat. Lbs. per ton.	Carbohydrates. Per cent.	Carbohydrates. Lbs. per ton.	Fibre. Per cent.	Fibre. Lbs. per ton.	Ash. Per cent.	Ash. Lbs. per ton.	Dry Matter. Per cent.	Dry Matter. Lbs. per ton.
1	Oats, ground........	C. E. Farm, Ottawa	12·68	253·6	10·44	208·8	3·22	64·4	59·93	1199·6	10·79	215·8	2·94	58·8	87·32	1746·4
2	Barley "	"	13·75	275·0	9·12	182·4	1·89	37·8	67·75	1355·0	5·09	101·8	2·40	48·0	86·25	1725·0
3	Wheat " No. 1 Hard..	Manitoba.................	9·08	181·6	13·83	276·6	2·03	40·6	71·51	1430·2	1·94	38·8	1·61	32·2	90·92	1818·4
4	" frozen, A........	"	14·75	295·0	13·50	270·0	2·22	44·4	64·57	1291·4	3·31	66·2	1·65	33·0	85·25	1705·0
5	" " B..........	"	11·14	222·8	13·69	273·8	2·57	51·4	66·57	1331·4	4·32	86·4	1·71	34·2	88·86	1777·2
6	Pease..........	C. E. Farm, Ottawa......	15·00	300·0	23·69	473·8	·85	17·0	50·16	1003·2	7·87	157·4	2·43	48·6	85·00	1700·0
7	Ind. Corn, Pearce's Prolific.	From Pearce & Co., London, Ont.	14·14	282·8	9·66	193·2	4·13	82·6	68·75	1375·0	1·92	38·4	1·40	28·0	85·86	1717·2
8	" Longfellow......	" " ..	13·78	275·6	9·59	191·8	4·19	83·8	69·17	1383·4	2·14	42·8	1·13	22·6	86·22	1724·4
9	" Thoroughbred White Flint........	" " ..	16·03	320·6	9·06	181·2	3·05	61·0	68·80	1376·0	2·03	40·6	1·03	20·6	83·97	1679·4
10	Wheat Bran.....	Yarmouth, N.S.	8·42	168·4	15·22	304·4	4·27	85·4	56·68	1133·6	9·81	196·2	5·60	112·0	91·58	1831·6
11	Corn "	"	7·19	143·8	10·75	215·0	8·60	172·0	57·83	1156·6	11·91	238·2	3·72	74·4	92·81	1856·2
12	Rice Meal.....	Victoria, B.C..	11·47	229·4	11·34	226·8	12·75	255·0	50·31	1006·2	6·95	139·0	7·18	143·6	88·53	1770·6
13	Straw, Oat, B. T	C. E. Farm, Ottawa	6·78	135·6	3·31	66·2	2·54	50·8	40·15	803·0	42·01	840·2	5·21	104·2	93·22	1864·4
14	"	"	7·11	142·2	3·11	62·2	2·74	54·8	37·10	742·0	44·34	886·8	5·60	112·0	92·89	1857·8
15	"	"	6·93	138·6	3·32	66·4	2·17	43·4	37·63	752·6	44·07	881·4	5·88	117·6	93·07	1861·4
16	" W. R.........	"	7·99	159·8	5·88	117·6	1·69	33·8	38·00	760·0	42·09	841·8	4·35	87·0	92·01	1840·2
17	"	"	8·31	166·2	5·50	110·0	1·93	38·6	38·38	767·6	41·95	839·0	3·93	78·6	91·69	1833·8
18	"	"	7·84	156·8	3·29	65·8	1·74	34·8	37·12	742·4	45·24	904·8	4·77	95·4	92·16	1843·2
19	Straw, Barley, P. P........	"	7·85	157·0	3·90	78·0	2·17	43·4	38·48	769·6	42·46	849·2	5·17	103·4	92·15	1843·0
20	"	"	7·83	156·6	4·02	80·4	2·17	43·4	40·68	813·6	40·39	807·8	4·91	98·2	92·17	1843·4
21	"	"	10·61	212·2	3·85	77·0	2·00	40·0	37·33	746·6	41·12	822·4	5·09	101·8	89·39	1787·8
22	" D. C.......	" ...	8·18	163·6	3·48	69·6	2·42	48·4	38·32	766·4	43·56	871·2	4·04	80·8	91·82	1836·4
23	"	"	8·84	176·8	3·99	79·8	3·16	63·2	38·31	766·2	41·78	835·6	3·92	78·4	91·16	1823·2
24	"	"	8·26	165·2	3·69	73·8	2·72	54·4	39·50	790·0	41·98	839·6	3·85	77·0	91·74	1834·8
25	Straw, Wheat, C. T.......	"	7·82	156·4	5·64	112·8	1·38	27·6	36·53	730·6	44·56	891·2	4·07	81·4	92·18	1843·6
26	"	"	8·29	165·8	4·48	89·6	1·74	34·8	38·19	763·8	43·64	872·8	3·66	73·2	91·71	1834·2
27	"	"	8·34	166·8	6·21	124·2	·96	19·2	35·98	719·6	44·46	889·2	4·05	81·0	91·66	1833·2
28	" R. G..	"	7·98	159·6	3·16	63·2	2·88	57·6	38·05	761·0	44·75	895·0	3·18	63·6	92·02	1840·4
29	"	"	7·87	157·4	3·56	71·2	2·01	40·2	36·07	721·4	47·29	945·8	3·20	64·0	92·13	1842·6
30	"	"	8·00	160·0	3·73	74·6	1·94	38·8	37·12	742·4	45·38	907·6	3·83	76·6	92·00	1840·0
31	Beans, whole plant, Broad Windsor	"	84·52	1690·4	2·82	56·4	·62	12·4	5·89	117·8	4·84	96·8	1·31	26·2	15·48	309·6
32	" " ..	"	84·59	1691·8	3·33	66·6	·63	12·6	5·67	113·4	4·14	82.8	1·64	32·8	15·41	308·2
33	Beans, English Horse	"	89·24	1784·8	2·75	55·0	·73	14·6	2·26	45·2	3·71	74·2	1·09	21·8	10·76	215·2
34	" "	"	86·15	1723·0	2·69	53·8	·66	13·2	4·17	83·4	4·98	99·6	1·35	27·0	13·85	277·0
35	" whole plant, Telephone..................	"	83·81	1676·2	2·99	59·8	1·00	20·0	6·79	135·8	3·70	74·0	1·71	34·2	16·19	323·8
36	Sunflowers, stalks and leaves	"	84·45	1689·0	·96	19·2	·87	17·4	6·12	122·4	5·67	113·4	1·93	38·6	15·55	311·0
37	" head with seeds.	"	75·62	1512·4	2·35	47·0	4·86	97·2	7·88	157·6	7·94	158·8	1·35	27·0	24·38	487·6

CONCENTRATED FODDERS.

No. 1. Oats.

The percentage of hull, which in the case of the oat is consumed by the animal with the kernel, is usually from 30 to 35. Some difference in composition exists between the varieties of oats, chiefly due to the fact that the amount of the hull is dependent largely upon the variety. The less hull, the higher the albuminoids. Compared with the other cereals we notice (1) that in albuminoids (the most important and valuable of all the constituents) oats stand higher than barley and lower than wheat, and (2) that oats are richer in fat than either of the last mentioned cereals. Experiments have shown them to have a very uniform digestibility, and experience has proved them to be the best food, in conjunction with a proper amount of bulky fodder, for working horses. These excellent qualities are no doubt largely due to the loose, mealy character of the ground grain, which allows the digestive fluids to act freely.

No. 2. Barley.

The more plump and better coloured grades of barley must be considered too expensive for feeding, since they command a high price for malting purposes. It often happens, however, that unpropitious weather during harvesting, and other circumstances, cause a more or less shrivelled and badly coloured grain. It may be found more economical to feed such grain than to sell it. The percentage of albuminoids in such barley is higher than in that of the best malting grades, and hence it is more valuable as a food. Speaking of barleys as a class, their albuminoids and fat are lower than in the other cereals. Barley does not contain as much hull as oats, hence its amount of fibre is much less, though still greater than that in wheat. Owing to this lack of hull principally, the practice of grinding barley and mixing it with cut clover is widely adopted. This gives greater bulk to the fodder and thus furnishes an increased surface of the concentrated portion of the feed to the solvent action of the digestive secretions.

No. 3. Red Fife Wheat.

This represents the average composition of Red Fife wheat from Manitoba, classed No. 1 hard. The high percentage of albuminoids and the small quantity of water point emphatically to the high feeding value of this grain. The unrivalled reputation which this wheat bears for flour production, naturally makes it too valuable to use as a cattle food. Its analysis is inserted here for the sake of comparison with the analyses of frozen wheat—two of which immediately follow.

Nos. 4 and 5. Frozen Red Fife Wheat.

It sometimes happens that early autumnal frosts in Manitoba and the North-West Territories deteriorate large quantities of wheat. This has hitherto been sold by the farmers at a great sacrifice, as the millers value it at an exceedingly low figure for their purposes. From experiments tried at the Central Experimental Farm, Ottawa, by Mr. Jas. W. Robertson, Agriculturist, it has been proved that frozen wheat may be used profitably for the fattening of swine, (See Bulletin 16). The analyses here given were made on the same wheats as used in those experiments, and are therefore of particular interest.

First, it will be noticed that frozen wheat contains more water than wheat properly and favourably matured. This is as might be expected, since the development of the frozen grain is arrested while it is yet more or less in the doughy state. The albuminoids, though somewhat lower, have not suffered materially. They still exceed the percentage found in soft fall wheats. Other and noticeable features are that the carbohydrates are 5 per cent to 6 per cent lower and that the fibres somewhat higher in the frozen wheat, than in the No. 1 hard. Considered from the standpoint of composition, I think we may conclude that frozen wheat as a cattle food does not rank as much inferior to well ripened and mature grain.

No. 6. Pease.

Pease are characterized by a very high percentage of albuminoids, approaching one quarter of their weight. They are remarkably poor in fat, and possess less carbohydrates than the cereals. For these reasons, it becomes necessary to supplement them with some more bulky and less nitrogenous fodder, in order that a proper ratio of the various constituents may be maintained, the digestive fluids allowed to act freely, and the health of the animal not impaired.

Nos. 7, 8 and 9. Indian Corn.

These are the analyses of the grain of well known varieties. The merits of corn meal as a feeding stuff are widely recognized. It produces much animal heat and possesses special value as a fattener. In the United States it is very extensively used for all classes of animals; over certain large areas it forms almost exclusively the "concentrated" fodder employed.

With the exception of malting barleys, corn ranks lower in albuminoids than the cereals, and possesses, according to our analyses, a larger percentage of water. In fat, however, it is richer.

Like other foods of a similar concentrated character, it should be fed in a ground condition, and be supplemented with more bulky food. It may here be noted that experiments have demonstrated that a greater proportion of a concentrated fodder is digested when the same is fed in a ground condition and mixed with cut hay or similar fodder, than when given whole and alone; and further, that the health of the animal is also the better maintained thereby.

No. 10. Wheat Bran.

According to the method of milling used, the composition of bran will vary within slight limits. The present analysis, however, may be considered an average one. It supports the general belief that bran has a high nutritive value. The percentage of albuminoids in bran exceeds that in the whole grain, owing to the gluten granules lying more particularly in the outer coat of the kernel. In fat also, it is richer than the whole wheat. It possesses a larger amount of fibre, as might be expected. Careful experiments have shown that in digestibility bran is equal to the grains; its use, therefore, rather than that of these more costly foods, must be considered economical. It has *special merits as a milk producer*, and is consequently fed with advantage to milking cows.

No. 11. Corn Bran.

This is a bye-product formed in the milling of Indian corn. Compared with wheat bran it is seen to be richer in fat, but considerably poorer in albuminoids. It is about equal to it as regards soluble carbo-hydrates, but possesses somewhat more fibre.

No. 12. Rice Meal.

This sample was sent by a correspondent in Salt Spring Island, B.C., who says that the rice comes direct from China, and is ground at Victoria. He further adds that it is extensively used as a food for hogs and cattle in his neighbourhood, owing to the very high price of oats, pease and other grains.

The whole grain—hull and kernel—is evidently ground, since the meal is of a yellowish colour, and contains pieces of the husk. It is in a very satisfactory degree of fineness.

From the analysis, I should judge it to be a valuable food. Though it does not quite equal wheat bran in albuminoids, it is seen to contain a higher percentage of fat.

COARSE FODDERS.

STRAW.

There now follow analyses of eighteen samples of the straw of the cereals; oats, barley and wheat. Two varieties of each have been examined, the samples being taken at three different stages in the growth of the plant.

The composition, and hence the value, of straw is dependent upon many factors, and according to circumstances, varies within comparatively wide limits. These factors are, chiefly, the richness of the soil, the manner of sowing, the maturity of the plant when cut, and climatic conditions during harvesting.

Good straw is a valuable fodder, but should never be used alone. As regards digestibility it is not much inferior to other coarse feeding stuffs. It is not, however, rich in albuminoids or fat, and consequently can only form a portion of any economical cattle ration. The nutritive ratio (that is the proportion of digestible albuminoids to the other digestible constituents taken together) of good straw varies from 1:25 to 1:30. Since in a properly balanced ration, this ratio is between 1:5 and 1:6, the mistake often made in feeding straw alone is apparent.

Nos. 13, 14 and 15, oat straw, variety, Black Tartarian.
" 16, 17 and 18, " " White Russian.
" 19, 20 and 21, barley straw, variety, Prize Prolific.
" 22, 23 and 24, " " Danish Chevalier.
" 25, 26 and 27, wheat straw, " Campbell's Triumph.
" 28, 29 and 30, " " Rio Grande.

SUNFLOWERS AND BEANS.

The analyses Nos. 31 to 37 are of certain new fodder crops, cut in the green condition. They consist of sunflowers and three varieties of beans. In the case of the former, the analyses of the stalks and leaves (taken together) and of the heads with seeds, are given separately. With the beans, the whole plant (leaves, stalk and pods) was analysed.

These crops were grown on the Central Experimental Farm, Ottawa, during the past season by Mr. Jas. W. Robertson, Agriculturist, with a view of using them as ensilage. Corn ensilage is too poor in albuminoids to allow it to form more than a part of any ration; the bean plant ensilage, if in good condition and palatable to cattle, would furnish a large proportion of these important constituents, as it comes nearer to the composition of a complete food. With regard to the sunflowers, their value was more or less conjectural, as no analysis of these could be found, though it was well known that their seeds contained a large quantity of oil.

BEANS.

NOS. 31 AND 32. THE LONG-POD OR BROAD WINDSOR BEAN.

Cut, August 11th. Grown on light sandy soil, in rows *per se*. The plants were about three feet high and the pods half mature.

No. 32. The same plant taken August 13th, but grown in rows with corn. The plants were about three feet high and in pod.

For a green fodder, and one containing nearly 85 per cent of water, it is remarkably rich in albuminoids. No deterioration in value by growing with the corn is seen to have taken place, but rather the reverse, the albuminoids being somewhat higher and the fibre lower in those plants grown with the corn.

NO. 33. THE ENGLISH HORSE BEAN.

Grown on light soil, in rows with corn. Height of plant when cut about three feet. In flower.

It is of the same general character as those already considered, but contains more water and less fibre, doubtless owing to the fact that it was taken at an earlier period of growth.

No. 34. The English Horse Bean.

Grown under exactly similar circumstances to No. 33, but cut at a later period of growth, viz., when the plant was about three feet six inches high and the pods about one-third matured.

It consequently contains more dry matter than No. 33, and possesses a higher percentage of fibre.

No. 35. The Telephone Bean.

Grown with corn, in rows. Cut while in pod and quite green, on 27th September From its composition and succulent character, it is undoubtedly valuable fodder.

A ton of good corn ensilage contains from 35 lbs. to 40 lbs. of albuminoids; a ton of bean ensilage, from 55 lbs. to 70 lbs. A mixed ensilage from corn and beans, therefore, will have a much higher feeding value than one from corn alone.

The use of such a mixed ensilage would effect a considerable saving in the meal portion of the ration, since the albuminoids would thereby be largely supplied.

Sunflowers.

Three plants were cut, on 9th September, at about one inch from the ground. The stems were still quite green and apparently succulent. The following weights and measurements were then taken.

	Lbs.	oz.
Stalks and leaves	6	10
Heads with seeds	3	11
Seeds alone	1	$4\frac{3}{4}$
Receptacle and petals	2	$6\frac{1}{4}$
	Feet	in.
Height	6	10
Diameter of heads		$8\frac{2}{3}$

No. 36. Sunflower stalks and leaves.

These contain but very little nutriment, being low in albuminoids and fat and containing a large percentage of water. Though still green their fibre was of a woody nature. Their food value is exceedingly low.

No. 37.—sunflowers—heads with seeds.

A marked difference is to be noted between this analysis and the previous one. The water is 10 per cent less, the albuminoids nearly three times higher, and the fat six times greater than in the stalks and leaves.

The "heads with seeds" would not furnish an ensilage as rich in albuminoids as that from beans, yet in this respect it would be considerably more valuable than that from corn alone. In fat, however, the "heads with seeds" ensilage is very much richer than that of either corn or beans.

Granting that the fibre of the "heads with seeds" is fairly digestible, the indications are that a well balanced and nutritious ensilage may be made by mixing the three crops, corn, beans and sunflower "heads with seeds" in the silo. The first would supply the large bulk of the carbohydrates, the second, the albuminoids chiefly, and the last, fat and albuminoids.

PART II.

FERTILIZERS.

The factors that conduce to luxuriant growth and plentiful harvests are (1) an abundant supply of available plant food in the soil, and more especially of nitrogen, phosphoric acid and potash; (2) a right mechanical condition of the soil; and (3) favourable climatic influences. It is in connection with the first of these that we shall here consider briefly the relative merits of some materials of manurial value examined in the laboratories during the past year. To all who are anxious to progress towards a greater and more economical crop production, the fundamental importance of the subject will commend the careful perusal of this chapter.

For the present purpose, it may suffice to note that of all the constituents necessary for plant growth and development, nitrogen, phosphoric acid and potash are the most essential, since continuous cropping exhausts the soil more particularly of soluble, and hence of available, forms of these ingredients. Organic matter, lime, sulphuric acid and many other substances are not only useful but indispensable, but for the reason just stated may be considered of secondary importance.

Nitrogen as it exists free in the atmosphere can only be utilized, as far as is known, by certain plants known botanically as the Leguminosæ, to which pease, beans, clover, &c., belong. Under favourable conditions such plants have the power of utilizing large quantities of free nitrogen and storing it in their tissues. Hence their value as a crop to be turned in as green manure. Other farm crops must depend upon the supply of nitrates in the soil for their nitrogen. The nitrates are soluble and readily absorbed by the rootlets. The nitrogen of a soil may exist in many forms (organic, as in vegetable and animal matter, and inorganic, as in salts of ammonia, &c.), but before such can become of value to plants it must be converted into a nitrate. This is constantly being brought about in the manure pile, in the compost heap and in the soil, by certain microscopic plants under proper conditions of warmth and moisture. The decay or fermentation of nitrogenous organic matter (vegetable and animal) is always accompanied by the production of nitrates. It is worthy of note in this connection, that the presence of lime in the soil has been proved to assist in this nitrate production.

Phosphoric acid and potash are the results of disintegration and decomposition of the rock from which the soil was originally derived. By the chemical changes brought about in the soil and by the solvent action of the fluids exuded from plant rootlets, small quantities of these constituents are constantly being converted into soluble forms fit for plant nutrition.

In considering the relative value of a manure therefore, we must take into consideration (1) the amounts or percentages of nitrogen, phosphoric acid and potash contained; (2) the degree of solubility in which these constituents exist; (3) the composition and character of the soil; and (4) the crop to be manured.

FARM-YARD MANURE.

By farm-yard manure is generally understood the mixed dung and urine of horses and cows, together with the litter used in bedding these animals.

Its value primarily and principally depends upon the amounts of nitrogen, phosphoric acid and potash contained in it. It must not, however, be lost sight of that much benefit ensues from the setting free of other inorganic elements used by plants, such as lime and magnesia, and also that the decomposition of the organic

matter of the manure gives rise to carbonic acid, which assists in rendering available plant food locked-up in the soil. These sum up the value of farm-yard manure from a chemical standpoint.

Farm-yard manure, however, plays a very important part in the improvement of tilth, in ameliorating the mechanical condition of a soil. The size of the soil granules, the ability to retain a proper degree of moisture and temperature—all indispensible factors of a fertile soil—are in many instances largely the outcome of judicious manuring.

It is, however, the intention here to consider only the composition of the manure and the various causes which effect its value as a direct supplier of plant food.

The composition of farm-yard manure in the fresh state depends upon:

1. The proportion of horse to cow manure.
2. The proportion of the litter (usually straw) to the excrements.
3. The quantity and quality of the food used.
4. The age and function (milk, wool producing, &c.,) of the animal.
5. The care with which the liquid portion is retained in the manure.

1. That there should be a marked difference in composition between the excrements of carnivorous and herbivorous animals—the former containing more nitrogen than the latter—might naturally be expected; but that the dungs of the various farm animals differ much in quality is a fact not as yet widely recognized.

The following tables show the average composition of the mixed excrements, of the horse, cow, sheep and pig, in the proportions in which they are produced, without litter. These data have been obtained from sources, chiefly Continental. They cannot be regarded as absolute, but while they may be subject to considerable variation, the relative value of one manure to another is maintained.

Composition of the Mixed Excrements (Boussingault).

—	Nitrogen.		Phosphoric Acid.		Potash.	
	Per cent.	Per ton.	Per cent.	Per ton.	Per cent.	Per ton.
		lbs.		lbs.		lbs.
Horse, mixed excrements	·705	14·1	·25	5·0	·134	2·68
Cow " "	·547	10·9	·08	1·6	·304	6·08
Sheep " "	·71	14·2	·25	5·0	·87	17·4
Pig " "	·37	7·4	·28	5·6	....	....

A study of this table will show horse manure and sheep manure to be very similar in the amounts of nitrogen and phosphoric acid they contain, being richer in these elements than those from cows and pigs, with the exception of phosphoric acid in the case of the latter. It is also worthy of note that cow and horse manure supplement one another, the former being rich in potash, the latter in nitrogen and phosphoric acid. Together they form a complete manure, furnishing in good proportions the three essential constituents of plant food.

The following table has been compiled by Heiden, a celebrated German authority. It gives the averages of a very large number of analyses.

COMPOSITION of the Mixed Excrements (Heiden.)

—	Nitrogen.		Phosphoric Acid.		Potash.	
	Per cent.	Per ton.	Per cent.	Per ton.	Per cent.	Per ton.
		lbs.		lbs.		lbs.
Horse, mixed excrements.........	·6	12·0	·3	6·0	·5	10·0
Cow " "	·34 to ·44	6·8 to 8·8	·1	2·0	·8	16·0
Sheep " "	·9	18·0	·5	10·0	1·0	20·0
Pig " "	·5 to ·6	10·0 to 12·0	·1	2·0	·5	10·0

From these averages it is also seen that the composition of farm-yard manure is materially affected by the proportion of cow to horse manure it contains.

2. There are many materials used for litter: peat, moss, dried leaves, sawdust and other substances; but since wheat straw is almost universally used, it will suffice here to show how the amount employed affects the composition of the resultant manure.

COMPOSITION OF WHEAT STRAW.

	Per cent.	Lbs. per ton.
Nitrogen..	·55	11·0
Phosphoric acid..	·61	12·2
Potash...	·86	17·2

Owing to the power that straw has to resist fermentation, its fertilizing elements cannot be considered as valuable, pound for pound, as those in dung and urine. This refers more particularly to its nitrogen. Some practical farmers consider the manurial value of straw as almost entirely dependent upon its mineral constituents. Straw, however, forms an excellent litter: in its two-fold function it furnishes a clean and warm bed for the animals, while at the same time it absorbs and retains their liquid excrements. Consequent upon its tubular structure, there are few other bedding materials that can equal straw in its ability to absorb liquids.

3. Carefully conducted experiments have demonstrated that the fertilizing elements (nitrogen, phosphoric acid and potash) of a food, save those which are used in the formation of milk, wool or increase of live weight, are voided in the solid or liquid excrements. The amounts so eliminated from the system represent a very large percentage of those present in the food, and this is true even in the case of rapidly growing animals and of those in full milk. The quality of the manure, therefore, is dependent upon the quality of the food. Poor feed makes poor manure; a scanty ration—or one in insufficient quantity—results in a small amount of manure. A fodder rich in fertilizing elements will produce manure more valuable than that obtained from stock fed on a poorer ration. Thus the manure from cattle wintered on straw is worth very much less per ton than that from liberally fed stock.

4. In the preceding paragraph we have seen that a certain small percentage of the fertilizing elements of food is used in the animal system for the manufacture of products, such as milk and wool and for the increase of weight through the formation of animal tissues. This percentage fluctuates with the age and function of the animal. As it varies the percentage eliminated in the dung and urine vary,

for the more the animal takes out of the food, the less there is to go into the manure. Young and growing cattle develop bone and muscle, making large demands upon the nitrogen and mineral constituents of the food. Cows in milk also require like material to produce the daily output. Supplied with food of a like quality, adult cattle, producing no milk and not gaining in weight, yield the richest manure, since in merely maintaining life the fertilizing constituents may be said to be entirely eliminated in the dung and urine.

5. The fact that urine has a much greater manurial value than the solid excreta cannot be too strongly emphasized. The neglect of many of our farmers to thoroughly appreciate this truth is only too apparent.

Our purpose here will be served if we consider the composition of the urine and of the dung from the horse and cow. The following figures may be taken as representing averages, and record the number of pounds of each constituent in one ton.

Constituent.	Horse.		Cow.	
	Urine.	Dung.	Urine.	Dung.
Nitrogen	30·4	11·2	21·0	8·7
Phosphoric acid	....	7·0	....	2·4
Potash	18·5	2·0	27·2	·8

If we assign to these constituents the following values: Nitrogen, 17c. lb.; phosphoric acid, 7c. lb.; potash, 5½c. lb.; the above data show that:

One ton horse urine is worth	$6.20
One ton horse dung is worth	2.50
One ton cow urine is worth	5.07
One ton cow dung is worth	1.69

Since the plant food in urine is more readily fermented and available than in the solid excrement, the difference in favour of the liquid manure is really greater than appears by these figures.

It will be well at this juncture to consider the composition of the liquid which drains from the manure heap, since in part at least, it is derived from the urine. It is highly colored, often quite black, strongly alkaline and effervesces vigorously with acids. On analysis, three different samples were shown to contain in 1,000 parts the following:—

	A.	B.	C.
Nitrogen	·511	1·14	1·60
Phosphoric acid	·104	·038	·10
Potash	2·660	1·980	4·90

Since all this plant food is in solution, the great value of this liquid and the economy in preserving it will be apparent.

If the manure heap has been exposed to heavy and constant rains, the composition of its drainage water* may not be equal to those quoted above; on the other hand, there are undoubtedly many instances where the drainage water is still more valuable. Taking these figures as fair averages, we can readily imagine the large amount of plant food lost annually on some farms.

* It will be noticed that this drainage water is very rich in potash—much more so than in nitrogen or phosphoric acid. It has generally been supposed that leaching manure results chiefly in a loss of nitrogen; recent experiments have shown that it is the potash which suffers the greatest loss.

This liquid has an especial value besides the one just cited. It possesses large quantities of carbonate of ammonia and carbonate of potash. These are capable of acting as a solvent upon the nitrogenous and non-nitrogenous solid portions of the manure, setting free for plant use both nitrogen and mineral matter. It is also a favourable medium for the development of those ferments whose function it is to decompose or rot the manure.

Composition of Barnyard Manure.

In connection with some experiments that will be detailed in a subsequent paragraph, the composition of two samples of mixed (horse and cow) manure made on the Central Experimental Farm, was ascertained this year. One sample was taken after fermentation, and the heap had become cold; the other while the fermentation was at its height.

The analyses are as follows:—

Analyses of farm-yard manure, mixed (horse and cow), Central Experimental Farm.

No.	Condition.	Water.	Organic matter.	Ash or Mineral matter.	Nitrogen.
		p.c.	p.c.	p.c.	p.c.
1	Well rotted; after fermentation................	80·88	14·17	4·95	·515
2	Rotting; during fermentation..................	79·27	17·38	3·35	·490

Calculating the amount and value of these fertilizing constituents, we obtain the figures in the subjoined table.

Amount and Value of chief fertilizing Constituents in Farm-yard Manure, per ton of 2,000 lbs., Central Experimental Farm.

No.	Nitrogen.		Potash.		Phosphoric acid.		Total value.
	Amount.	Value.	Amount.	Value.	Amount.	Value.	
	Lbs.	$ cts.	Lbs.	$ cts.	Lbs.	$ cts.	$ cts.
1	10·3	1 75	15·9	0 87	8·5	0 60	3 22
2	9·8	1 67	13·6	0 75	6·0	0 42	2 84

For the sake of comparison, I append a number of analyses, the work of several agricultural chemists.

Analyses of manures.

—	Pounds per ton.		
	Nitrogen.	Phosphoric acid.	Potash.
Manure, fresh..	7·8	3·6	9·0
" rotted..	10·0	5·6	10·6
" well rotted..	11·6	6·0	10·0
" from Rothamsted....................................	12·8	4·6	6·4
" " Tremblaine....................................	7·2	16·4	....
" " Swiss farms....................................	7·6	4·4	....

The percentage composition of the mineral matter of those samples of manure (C. E. F.) above referred to, is now given. As, in addition to potash and phosphoric acid, lime, magnesia and iron are all required by plants, this table will be of interest in showing how far these elements are supplied in ordinary manure.

Composition of Ash (Mineral matter) of Farm-yard Manure, Central Experimental Farm.

No.	Insoluble residue.	Lime, Oxide of iron and Alumina.	Magnesia.	Potash.	Phosphoric acid.
1	48·60	17·02	4·05	16·17	8·65
2	44·19	16·29	4·42	20·07	9·03

Loss of Nitrogen, as Ammonia, from Manure.

When stables and cow houses are badly kept or there is a deficiency of litter, ammonia is abundantly developed, and, as it is extremely volatile, much is lost. This ammonia is formed by the fermentation of the urine—carbonate of ammonia being produced at the expense of its urea, the nitrogen-holding compound of urine. While carbonate of ammonia is volatile, it is also extremely soluble in water, and hence it is that the greatest escape of this valuable material occurs when the manure heap is allowed to become dry. In order to rot manure and render available its plant food, this conversion, to a greater or less extent, must take place, and for this, moisture and warmth are requisite. If the heap be kept constantly moistened, preferably with its own drainage fluid (or if necessary with water only) no appreciable loss of ammonia need be feared. Manure must not, on the other hand, be kept in such a soaked condition that the air cannot permeate it, else (as we shall see later on) but little fermentation can ensue. These are the principles to be followed in the economical fermenting of manure.

When well rotted manure is spread on the field, preparatory to being ploughed in, it cannot of course have this care bestowed upon it. Does it then when so lying on the field lose any of its ammonia? To answer this question, the experiments about to be described were made this summer.

Two samples of manure were taken, as before stated; one during fermentation and while the heap was very hot—the other after fermentation had apparently ceased and the heat had subsided. Careful estimations of their nitrogen were at once made. These two samples were then spread in a thin layer on panes of glass and exposed to the sun every day for a month, under shelter from rain. As the layers were comparatively thin, no fermentation took place after the experiment was begun, the manures soon becoming hard and dry. Any loss, then, that might occur would result from the volatilization of ammonia formed in the manure before the experiment. As far as the answer to our question is concerned these conditions are the same as those after the spreading of the manure in the field—since, in the latter case, previous fermentation would be arrested, and fertilizing material washed from the manure by the rain would be received and retained by the soil. Any loss that might occur through volatilization on the field should also take place on the glass plates of our experiment. At the end of the month the amounts of nitrogen in the samples were again taken, with the results set forth in the following table, which also shows the value of the manure in nitrogen before and after the experiment.

NITROGEN in Farm-yard Manure, Central Experimental Farm.

No.	Manure.		Per cent.	Amount per ton in pounds.	Per cent lost on exposure.	Value at 17c. per lb.
						$ cts.
1	Well rotted; after fermentation.	Before exposure....	·515	10·3	....	1 75
		After "	·505	10·1	·01	1 72
2	Rotting; during fermentation.	Before exposure.....	·490	9·8	....	1 67
		After "	·466	9·3	·024	1 58

We may therefore safely infer that the loss of ammonia through volatilization on the field is extremely small.

THE APPLICATION OF MANURE.

Whether manure should be applied and ploughed in while fresh rather than in a rotted or semi-rotted condition, must depend upon the character of the soil and the crop to be raised. With light soils that easily exhaust, it is certainly good practice to apply the manure in a semi-rotted condition. Light soils very often are not sufficiently moist to promote active fermentation. Again, they leach easily and therefore it should be the aim to manure for the coming crop, rather than to permanently improve the soil. And lastly, the season of growth on such soils is comparatively short, and therefore the plants should be given their food in an easily soluble condition that they may make the greatest development in the shortest time. Heavy clays and loams, on the other hand, often give better results from fresh than from rotted manure—especially when the saving of labour is taken into consideration. Such soils are retentive of plant food; they do not allow their fertilizing constituents to easily leach away. The soluble products of fermentation of the manure in the soil form a reserve fund for future crops. Further, such soils often form a suitable medium for fostering fermentation and are themselves improved in their mechanical condition or tilth by the fermentation process and the presence of the litter.

THE CAUSES, CONDITIONS AND RESULTS OF FERMENTATION.

Fermentation in the manure heap is brought about by the agency of microscopic plants known as Bacteria. They require for their development and multiplication, organic matter, warmth and moisture. These bacteria are of two kinds (1) aerobic, or those requiring the oxygen of the air for their existence; (2) anaerobic, or those which can develop in an atmosphere destitute of oxygen. As the conditions for their development are different, so are the compounds produced by their life functions. The manure at the top of the heap is freely permeated by air. It is here that the aerobic ferments set up a combustion of the material, which is burnt by union with the oxygen of the air in the interstices forming carbonic acid, and much heat in consequence is generated. Lower in the heap, the heat decreases, since there the aerobic ferments cannot live for want of air. The anaerobic ferments that thrive at the bottom of the heap produce but little heat and disengage marsh gas as well as carbonic acid. In the first instance, the soluble carbohydrates of the litter and dung—gum and sugar—are burnt; in the lower part of the heap, the cellulose or fibre is principally decomposed.

Bacteria are present in both the solid and liquid portions of manures, but as it has been already stated, it is more especially in the latter that they find a favourable medium for their growth. Drenching the manure heap with the drainage liquid, therefore, not only affords the necessary moisture to retain the ammonia, but also introduces ferments which act beneficially.

We have hitherto considered the action of the bacterial ferments on the non-nitrogenous compounds of manure. It now remains to be stated that the nitrogen of urine and dung is converted into ammonia and finally into nitrates by their agency. The alkaline solution so produced is able to dissolve unattacked nitrogenous substances both in the litter and dung, and thus prepares for assimilation much plant nourishment otherwise valueless.

SUPERPHOSPHATE OF LIME.

"Superphosphate" is the result of treating bones or mineral phosphate with sulphuric acid. By this process the phosphoric acid hitherto existing in an almost insoluble condition is rendered soluble and immediately available for plants. The value of a sample of superphosphate depends therefore, not only upon the total phosphoric acid it contains, but also upon the proportion soluble in water. "Reverted" phosphoric acid is not so valuable for immediate plant nutrition as the "soluble," though it is much more available than the insoluble form.

The following analyses show the composition of two brands that we have used for experimental purposes and found satisfactory:—

ANALYSES of Superphosphates.

Name of Brand.	Water.	Insoluble rock matter.	Soluble phosphoric acid.	Reverted phos. acid.	Insoluble phos. acid.	Total phos. acid.
"Plain" superphosphate	9·13	6·12	7·72	1·62	3·00	12·34
"No. 1" superphosphate	5·91	11·51	10·78	1·97	3·89	16·64

Grain crops as a rule are benefitted by application of superphosphate, especially in conjunction with manure containing nitrogen. It has also been found exceedingly useful in quantities from 150 to 300 lbs. per acre, as a top dressing for turnips and other root crops.

BONE MEAL.

Bone meal, or finely ground unburnt bones, consists chiefly of phosphate of lime and organic matter—the latter containing much nitrogen.

Commercial samples possess from 17 per cent to 25 per cent of phosphoric acid and from 2 per cent to 4 per cent of nitrogen, according to the purity of the meal.

The following analyses are of two Indian bone meals used on the Central Experimental Farm last season. They purport to have been imported from India—serving as ballast on the voyage. They are both finely ground, a matter of great importance --No. 5 being somewhat the finer of the two.

ANALYSES of Indian Bone Meals.

—	No. 4.	No. 5.
Moisture	7·75	5·90
Organic matter	24·09	19·76
Mineral matter soluble in acid	57·42	51·75
Mineral matter insoluble in acid	10·74	22·59
	100·00	100·00
Phosphoric acid	22·05	18·07
Nitrogen	3·29	2·42

Assigning the values for phosphoric acid and nitrogen fixed by the Inland Revenue Department for these ingredients in bone meal, we obtain the following:—

—	No. 4 per ton.	No. 5 per ton.
	$ cts.	$ cts.
Phosphoric acid at 6c. per lb.	26 46	21 68
Nitrogen at 14c. per lb.	9 21	6 77
	35 67	28 45

In the presence of moisture and warmth, bone meal is decomposed in the soil, the nitrogen and phosphoric acid becoming converted into assimilable forms for plant food. This fermentation goes on best in fairly open soils and proceeds but slowly in heavy clays, which exclude the air necessary for the process.

As bone meal possesses no potash (an essential element of plant food), wood ashes or some other potash fertilizer may be mixed with the meal before application. Excellent results are obtained by this method.

Superphosphate gives more immediate returns than bone meal, owing to the fact that the greater part of its phosphoric acid is soluble in water; the effects of an application of bone meal are, however, more lasting.

For turnips and other root crops, bone-meal is considered a valuable top-dressing; for wheat, however, and short-seasoned crops, superphosphate is usually preferred.

BONE-CHAR SCREENINGS

If bones are burnt with access to air, white Bone-ash results; when, however, they are heated out of contact with air (as in an iron retort) certain volatile substances are given off and bone-black, known also as Bone-char or bone charcoal, remains behind. This bone-char consists of bone ash (phosphate of lime, principally) and carbon or charcoal—the latter being from the incomplete combustion, of the organic matter of the bones. The nitrogen of the organic matter is given off (as ammonia, principally) during the heating of the bones.

Bone-char, owing to its porous character and decolourizing power, is largely employed in sugar refineries. After it has been used for clarifying the solution of brown sugar, it is known as "spent" bone-black, and is sold as a source of phosphoric acid for use in agriculture. Fresh bone-char, from its method of production, contains little or no nitrogen "Spent" bone-char however may possess comparatively large quantities of this element. If blood is used in the sugar refinery, the nitrogen in the char will vary from 5 per cent to 15 per cent; if blood is not used, it is much lower, the nitrogen being obtained only from the organic impurities of the sugar. From 5 per cent to 1 per cent in the latter case is usually present.

The following sample of bone-char screenings was forwarded by Mr. E. C. Cole, of Moncton, N.B., and was obtained from the Moncton Sugar Refining Company. It is the screening from the char used for filtering purposes, and was sold at $20 per ton. "Spent" char is also sold by the same firm at about the same price.

ANALYSIS of Bone-char Screenings.

Moisture	1·10
Organic and volatile matter	12·32
Mineral matter soluble in acid	84·40
Mineral matter insoluble in acid	2·18
	100·00
Phosphoric acid	33·78
Nitrogen	·414

Allowing 3 cents per lb. for phosphoric acid, and 8 cents per lb. for nitrogen, this material is worth $20.96 per ton.

The phosphoric acid in bone-char is scarcely equal in value for agricultural purposes to that in bone-meal, since there is no nitrogenized organic matter to set up fermentation in the soil, and thus render it available.

FISH MANURE.

The refuse accumulating at fish canning factories, packing-houses and ports from which fish are shipped, is known as fish scrap, fish waste, or fish manure. Nitrogen and phosphoric acid are its chief constituents of value. Though necessarily of variable composition, fish refuse may always be considered a strong and forcing manure, fermenting easily, and readily yielding its fertilizing elements to the growing crop.

The sample here reported upon was made at Digby, N.S., seven or eight years ago. It was forwarded for analysis by P. Innes, Esq., Kentville, N.S.

ANALYSIS OF FISH MANURE.

Moisture	29·40
Organic and volatile matter	20·28
Mineral matter soluble in acid	49·01
Mineral matter insoluble in acid	1·31
	100·00
Nitrogen	2·39
Phosphoric acid	4·70

Valuing the nitrogen at 12 cents per lb., and the phosphoric acid at 6 cents per lb., one ton of the above is worth $11.37.

It may be applied as a top dressing, or lightly harrowed in. It should prove especially valuable for grain crops and grass. Used in conjunction with wood-ashes (or other form of potash) an efficacious fertilizer for all clases of farm crops would result. Decay and partial decompositon renders the plant food in this material more readily available.

When the soil is light and easily leached, it is not economical to apply soluble and concentrated manures in large quantities at once. A better practice is to apply them in small amounts and often, and if possible to the growing crop.

COD FISH BONE.

This waste product was forwarded by Gen. J. W. Laurie from Cape Negro, N.S., with a request for a report as to its value for manuring purposes. Regarding its occurrence, he writes: "I was struck with the large quantity of cod fish bones lying on the beach where our fishermen dress their fish. These bones are stripped of all flesh by the flies and bleached by the sun and weather." The sample received and analysed was a large back-bone, clean, white and dry. It was quite brittle and was easily pounded to a tolerably fine condition. This was then put through a mill to further reduce it. Its composition is as follows:—

ANALYSIS OF COD FISH BONE.

	Per cent.
Moisture	5·79
Organic matter	37·48
Mineral matter soluble in acid	55·13
Mineral matter insoluble in acid	1·60
	100·00
Phosphoric acid	22·41
Nitrogen	5·18

In the raw and untreated condition the finely ground fish-bone, according to the above analysis, may be valued as follows:—

	Per ton.
Phosphoric acid, 448·2 lbs., at $5\frac{1}{2}$ cts	$24 65
Nitrogen, 103·6 lbs., at 12 cts........................	12 43
Total........................	$37 08

These figures may be taken as representing a trade valuation; the exact agricultural value is dependent upon many factors, such as condition of soil, the climate, the crop to be raised and so on.

Its application without previous treatment, save being ground to a fine condition, would be followed, undoubtedly, by an increased crop yield, since by the action of soil-fermentation the nitrogen and phosphoric acid would slowly be rendered soluble. If, however, it is wished to obtain its beneficial effects the first season, the fish-bone should be fermented in the compost heap or treated with sulphuric acid. The former method is much to be preferred, as the use of the strong acid is dangerous in the hands of the inexperienced. The most suitable materials for composting the fish-bone are good farm-yard manure, or a mixture of lime and wood-ashes. The heap may be covered with muck or good earth, and kept moist. By this treatment the bones are broken down and in the course of a few months a concentrated and valuable manure results.

MARL.

Eight samples of this natural fertilizer, analyzed during the past year, are here reported upon. Four were from Ontario, three from Quebec and one from Nova Scotia.

An inspection of the subjoined table will show that great variation in composition, and hence in value, exists between them.

ANALYSES of Marls, 1892.

No.	Locality.	Sender.	Water.	Organic matter.	Insoluble residue.	Oxide of iron and Alumina.	Carbonate of lime.	Phosphoric acid.	Nitrogen.	Remarks.
1	Ste. Adelaide de Pabos, Que...	Rev. J. Dechamplain....	·42	3·60	2·76	1·84	88·36	None	....	An excellent specimen.
2	" "	"	8·77	24·27	11·00	2·00	52·83	"	·907	Contains 25 per cent organic matter, with nearly 1 per cent nitrogen.
3	Lot 12, Junction Gore, Gloucester Township, Ont	Alf. Brown........	·52	4·20	72·81	7·83	15·44	"	....	A poor sample, insoluble matter too high.
4	Ste. Geneviève, Que.........	J. A. Chauret..........	1·04	7·12	·94	·21	90·06	"	....	A very good sample.
5	Kinmount, Ont.	Henry Coben.........	1·68	10·55	·75	·39	87·11	"	....	"
6	Woodville, Ont.	Wm. Grant....	16·23	12·72	3·60	1·10	66·53	"	.....	Of good average quality.
7	Hants County, N.S.......	S. J. Jenkins...	10·16	22·87	19·55	3·35	42·15	Traces	·670	Contains also organic matter.
8	Wellington, Ont.............	W. P. Niles	66·02	5·53	1·36	....	....	"	....	Possesses large percentage of water, otherwise pure.

The chief agricultural value of marl lies in the fact that it supplies lime to the soil. Carbonate of lime—the form in which it exists in marl—is not caustic and cannot therefore injure vegetation nor destroy organic matter in the soil, as an over application of freshly burnt lime is apt to do. Carbonate of lime is dissolved by the carbonic acid of rain water and becomes plant food. It also acts beneficially in freeing other constituents, rendering them available. It is principally of service, however, in favouring the development of those micro-organisms of the soil which convert nitrogenous material into soluble nitrates—the condition or form of nitrogen which plants can use and convert into their tissues. So much so is this the case that soils otherwise rich do not yield maximum crops if lime is wanting or deficient in quantity. Fertile soils always contain lime. Experience corroborates science in the value of the application of lime or marl to soils rich in humus.

The well-known and beneficial action of lime and marl on plastic clays, as well as on peat and sandy soils, has been treated of at length in former reports.

SOOT.

This material has long been in use in Europe as a top-dressing for pasture and the cereals—more especially wheat. As such it bears an excellent reputation. Its chief fertilizing value lies in the amount of nitrogen it contains, though it also possesses (as a rule) small quantities of potash and phosphoric acid. The greater part of the nitrogen exists as salts of ammonia, a soluble and valuable plant food. Soot is somewhat variable in its per cent of nitrogen, and samples obtained under different circumstances have often widely different values. The causes for this are numerous. Pure soot is not easily procured; it is generally mixed to a greater or less extent with ashes or earth. Its richness in nitrogen is dependent not only on the kind of fuel (coal, wood, &c.) burnt, but also on the manner in which such is burnt. A slow fire, a weak draft and a good condensing chimney are conducive to a soot rich in nitrogen; while a bright fire, a strong draft and a short chimney will give only a small quantity of soot of poor quality.

A sample forwarded by Mr. E. McArdle, St. Catharines, Ont., was found on analysis to have the following composition:—

ANALYSIS OF SOOT.

Moisture	2·50
Organic and volatile matter	53·66
Mineral matter soluble in acid.	10·32
Mineral matter insoluble in acid	33·52
	100·00
Nitrogen	1·04
Potash	·22
Phosphoric acid	Heavy traces

Besides its role as a fertilizer, it is said by many gardeners to act beneficially in preventing the attacks of insect pests.

As a top-dressing, it may be applied at the rate of 25 to 50 bushels per acre to the young crop.

Assigning the following values:—Nitrogen, 17 c. per lb.; potash, 6 c. per lb.; the soot examined is worth $3.90 per ton.

PART III.

MISCELLANEOUS EXPERIMENTS AND ANALYSES.

THE BABCOCK METHOD FOR ESTIMATING BUTTER-FAT IN MILK.

That the *chief* value of milk, whether for consumption, the creamery or the cheese factory, lies in the amount of butter-fat it contains, is a fact that has become during the past few years more and more widely recognized.

Following naturally upon the acceptance of this fact there has arisen the endeavour, on the part of both the purchaser and vendor, to adopt the method of valuing milk according to its richness in fat. All interested in the great milk industries are realizing that quality as well as quantity must be taken into consideration if the sale of milk is to be put upon an equitable and business-like basis. As a means towards that end it is necessary that there should be forthcoming a reliable and easily-worked process for determining the percentage of fat in milk. Such a process we have in the "Babcock test." In Bulletin 12 of the dairy series, issued last year, we established by chemical proof the accuracy and reliability of this method, showing that while it is one that can be worked in the dairy and cheese factory, its results are such that all confidence may be placed in them as a basis for the valuation of the milk examined.

The chief drawback against the general adoption of this test in dairies has been the fact that it involved a considerable expenditure of time, since every patron's milk had to be examined daily. An alternative was offered in the use of corrosive sublimate or potash, which, being added to the milk, preserved it from decomposition. Such use allows a composite sample to be obtained, which can be examined by the Babcock method at the end of the week. There are several objections to the use of these preservatives, chief among which is the danger of using in a dairy such poisonous chemicals. The percentage of fat found in the composite sample multiplied into the total pounds of milk supplied by the patron during the week and divided by 100, gives the number of pounds of butter-fat.

An effort has been made in our laboratories to so modify the test that, while the use of chemicals and the second sampling of the milk are avoided, the examination of the milk of each patron need only be made weekly. Our efforts in this direction have been successful. It is found that when one-sixth ($\frac{1}{6}$) of the amount of milk recommended in the Babcock method is taken—the successive sixths for a week being run into the same test bottle—the same percentage of fat is obtained as by averaging the percentages of fat found by testing the milk daily. We have abundance of chemical proof to support this statement, but the insertion here of the data of three series of experiments will suffice.

Six days' Composite tests by the Babcock Method.

First series.			Second series.			Third series.		
—	Quantity of Milk.	Per cent of Fat.	—	Quantity of Milk.	Per cent of Fat.	—	Quantity of Milk.	Per cent of Fat.
	c. c.			c. c.			c. c.	
Monday	17·6	3·4	Monday	17·6	3·5	Monday	17·6	5·1
"	17·6	3·3	"	17·6	3·6	"	17·6	5·0
Tuesday	17·6	3·7	Tuesday	17·6	3·3	Tuesday	17·6	5·4
"	17·6	3·6	"	17·6	3·2	"	17·6	5·4
Wednesday	17·6	7·3	Wednesday	17·6	5·4	Wednesday	17·6	3·4
"	17·6	7·2	"	17·6	5·4	"	17·6	3·4
Thursday	17·6	2·9	Thursday	17·6	4·7	Thursday	17·6	3·7
"	17·6	3·0	"	17·6	4·7	"	17·6	3·6
Friday	17·6	9·1	Friday	17·6	3·4	Friday	17·6	4·9
"	17·6	9·2	"	17·6	3·4	"	17·6	4·9
Saturday	17·6	3·0	Saturday	17·6	4·6	Saturday	17·6	3·6
"	17·6	3·0	"	17·6	4·6	"	17·6	3·6
Average of above	.....	4·9	Average of above	....	4·15	Average of above	......	4·33
Monday to Saturday inclusive, composite test	2·93 2·93	4·8 4·9	Monday to Saturday inclusive, composite test	2·93 2·93	4·2 4·2	Monday to Saturday inclusive, composite test	2·93 2·93	4·4 4·4

It is thus apparent that by the use of a pipette which delivers ($\frac{1}{6}$) one-sixth of the amount ordinarily employed, namely, 2·93 c.c., the testing may be done once a week. The above figures show that this very large economy in time and labour is not accompanied by any sacrifice in accuracy. A large number of composite tests have lately been made, and sufficient data have accumulated to prove that the curdling and souring of the milk in the test bottle, which usually takes place on the third day, does not affect the accuracy of the test.

Bichromate Method.

Since the above work was finished, there has appeared in "Biedermann's Central Blatt für Agriculturchemie" an article by J. A. Alén, a chemist of Gothenburg, Sweden, upon the preservation of milk by means of potassium bichromate. This salt, when present only in small quantities, will prevent milk from coagulation for many weeks. The total solids and fat may be estimated in the preserved sample with accuracy. This opened up a new field for investigation in connection with the testing of composite samples. With the assistance of Mr. C. F. Whitley, of the Dairy Commissioner's staff, I have been enabled to test this method and to report as follows upon its efficiency: From 3 grains to 7 grains of this chemical are put in the bottle to hold the daily samples.* Into the bottle (there must be one for each patron) is run daily a small quantity of the milk supplied. Before the daily addition of the milk, that already in the bottle is gently shaken up, so that the risen cream may again be thoroughly mixed throughout the sample. At the end of the week the ordinary pipette full (17·6 c.c.) may be withdrawn and the fat estimated by the usual Babcock method. The sample bottle should be kept in a cool place, but there is no necessity to place it on ice. This method has given most satisfactory results, as the following table will show:—

*From our work here I find that the amount of bichromate used may vary within comparatively wide limits without the efficacy of the test being interfered with. I should advise purchasing the chemical in the powdered condition, then ascertaining the measure in a small spoon of say 10 grains. The bichromate may then be measured into the bottles instead of weighed, and thus a saving of much time effected.

PERCENTAGE OF FAT.

Composite Sample (6 days).	Bichromate and Babcock Test.	Average of Daily Analyses by Gravimetric Method.
Sample A	3·70	3·625
" B	3·55	3·505
" C	4·85	4·830

The above represents the results of three weeks trial, but subsequent work has confirmed the great accuracy here depicted.

The treated milk is perfectly fluid at the end of five weeks, and allows of a perfect sample being then taken.

Potassium bichromate is a red crystalline salt, easily soluble in water and milk. It imparts a deep orange red colour to the sample, so that there is no mistaking the latter for pure milk. It thus has a decided advantage over corrosive sublimate or potash, which do not colour the milk. It is poisonous, but not in so marked a degree as the substances just mentioned. In the quantities used (3 to 7 grains), it cannot be said to present any danger.

Commercial potassium bichromate is quoted at 14 cents per lb. This is sufficient for about 1,000 composite samples. By its use the testing of the milk is only necessary once a week, thereby saving a large expenditure of time and labour over the method now in vogue.

In working this method, I would advise the taking of the milk sample from the weigh can by means of a tube, open at both ends, of about one-eighth of an inch in diameter. The tube is placed in the can, the upper end closed with the finger and withdrawn. The contained milk is then allowed to run into the patron's sample bottle. In this way not only is a thoroughly representative sample obtained, but a proportionate amount of the milk daily supplied by each patron is secured. This is consequently more accurate than when an equal quantity is taken daily, as the results obtained give exactly the pounds of fat in the week's milk of each patron.

EXPERIMENTS ON THE PREVENTION OF SMUT IN WHEAT.

This is now the third year of experiment, the results of previous work having appeared in former annual reports. Very briefly, our conclusions up to 1892 were (1) that, while iron sulphate (1 lb. to 8 gall.) in no way injured the vitality of the wheat germ, it was useless in destroying smut spores; and (2) that copper sulphate (1 lb. to 8 galls.) was efficaceous in killing the smut, though when the solution was allowed to remain in contact with the seed for a long time, the vitality of the wheat was affected, the extent of the injury depending on the period of treatment. It was further stated that the small amount of loss in vitality was not to be compared with the advantage of having wheat free from smut, which follows the use of bluestone.

The experiments of the past year consisted in ascertaining the effect of different treatments (1) on the vitality of the germ and (2) on the prevention of smut.

The solutions used were all of the same strength: 1 lb. to 8 gallons.

In the case of the "agricultural bluestone" and copper sulphate, duplicate quantities of seed after treatment were dipped in lime water. It was hoped that by this means the injurious action of the salt of copper on the germ would be neutralized, while its effect as a fungicide would not be impaired. In all these trials the seed was immersed aud thoroughly stirred for five minutes in the solutions under experiment.

The following table shows the effect of the different treatments upon the wheat germ :—

Effect of Smut Preventives on the Vitality of Wheat, 1892.

Variety of Wheat. 200 grains.	Treatment.	Sown.	23rd March.	24th March.	25th March.	26th March.	28th March.	1st April.	Total.	Percentage of vitality.	Percentage of strong plants.	Percentage of weak plants.
Red Fife	Untreated	1892	163	176	179	182	183	183	183	91·5	84·5	7·
"	Iron sulphate	1892	95	154	162	167	171	172	172	86·	77·	9·
"	Agricultural bluestone	1892	95	156	175	180	188	192	192	96·	84·5	11·5
"	" and lime water	1892	168	190	192	192	194	194	194	97	92·	5·
"	Copper sulphate	1892	58	93	126	137	147	159	159	79·5	67·	12·5
"	" and lime water	1892	89	130	151	169	178	178	178	89·	81·	8·
Saxonka	Untreated	1892	159	183	190	191	192	192	192	96·	90·	6·
"	Iron sulphate	1892	136	174	184	185	189	190	190	95·	88·	7·
"	Agricultural bluestone	1892	81	121	147	155	173	177	177	88·5	76·	12·5
"	" and lime water	1892	154	179	188	189	191	194	194	97·	88·	9·
"	Copper sulphate	1892	45	87	108	127	155	169	169	84·5	66·	18·5
"	" and lime water	1892	103	143	170	180	184	187	187	93·5	84·	9·5
Red Fife	Untreated	1892	140	166	176	176	180	184	184	92·	82·	10·
"	Iron sulphate	1892	76	155	171	189	189	189	189	94·5	77·5	17·
"	Agricultural bluestone	1892	48	121	151	162	176	180	180	90·	69·	21·
"	" and lime water	1892	111	155	170	178	180	184	184	92·	76·	16·
"	Copper sulphate	1892	28	60	85	107	134	153	153	76·5	55·5	21·
"	" and lime water	1892	72	108	134	149	163	167	167	83·5	65·5	18·

From these data it will be observed (1) That the copper sulphate used alone or with iron sulphate (as in agricultural bluestone) lowers the percentage of vitality, corroborating previous results; (2) That the subsequent immersion in lime water of wheat treated with copper solutions lessens the injurious effect of the copper salts, not only in reducing the number of plants destroyed, but also in increasing the percentage of strong plants; (3) That the iron sulphate, as in previous experiments, as a rule does not affect the vitality of the wheat.

These treated wheats were then sent to Mr. Bedford and Mr. Mackay at the Experimental Farms at Brandon and Indian Head. Plots 10 feet by 10 feet were sown with them at the rate of $1\frac{1}{4}$ bushels to the acre. At the time of harvesting, the number of smutty heads and of good heads in each plot were counted.

On account of causes not under direct control, considerable irregularity marks the results. They, however, show :—

1. That sulphate of iron is not efficacious in destroying smut spores.
2. That sulphate of copper treatment is the most efficacious of all in preventing the development of smut.
3. That "Agricultural Bluestone" occupies, usually, a position between these two salts in reducing the amount of smut.
4. That the subsequent immersion in lime water of seed treated with copper sulphate and "Agricultural Bluestone," lessens the effect of these salts as smut preventives.

From these experiments and those of previous years, I conclude that copper sulphate solution is by far the most efficacious for killing the smut spores, and that it is doubtful, taking all things into consideration, whether the subsequent immersion in lime water is advisable.

WELL WATERS.

The work of analysing samples of well waters from farmers' homesteads has been continued, and seventeen waters are here reported upon. From the remarks in the last column of the table it will be noticed that in the large majority of instances the waters were seriously polluted and dangerous for use.

ANALYSES OF WELL WATERS, 1892.

Results Stated in Parts Per Million.

Number.	Name.	Locality.	Date.	Free Ammonia.	Albuminoid Ammonia.	Nitrogen in Nitrates and Nitrites.	Chlorine.	Total Solids at 100° C.	Solids after ignition.	Loss on ignition.	Oxygen absorbed at 80° F. In 15 min.	Oxygen absorbed at 80° F. In 4 hrs.	Phosphates.	Report.
1	Caron, S.	Lachenaie, Que.	April 16	1·94	·14	.....	620·0	1,582·0	1,504·0	78·0	.....	.....	Traces	A very dangerous water to use.
2	Carpenter, F. M.	Stoney Creek, Ont.	July 5	None	·10	7·428	275·0	1,416·0	1,166·0	250·0	·472	1·028	h. traces	Probably contaminated.
3	Anderson, S.	Harbord, Ont.	" 6	·01	·295	2·93	13·0	410·0	290·0	120·0	2·556	5·188	...	Not a good water. Too much vegetable matter.
4	Patterson, Wm.	Almonte, Ont.	" 11	·08	·12	2·141	22·5	426·0	290·0	136·0	·6736	1·0892	h. traces	A very suspicious water.
5	St. Louis Dam.	Rideau Canal, Ont.	" 11	·10	·435	None	·5	192·0	98·0	94·0	5·2676	9·5052	h. traces	Very bad water.
6	Anderson, S.	Harbord, Ont.	" 11	·14	·07	.....	6·0	....	....	.....	·9012	2·000	... .	Condemned for drinking purposes.
7	Michaelis, Gustav.	Balgonie, N.W.T.	Aug. 2	..	....	.....	70·0	4,328·0	3,460·0	868·0	.....	.....	....	Unfit for use. Large amount of epsom salts.
8	McCuaig, Duncan.	Drumconnor, Man.	" 6	·005	·065	6 05	18·5	342·0	320·0	40·0	.....	.....	Traces	Second-class water.
9	Popham, Stewart.	Brandon, Man.	" 19	·09	·125	·468	3·5	374·0	264·0	110·0	·908	1·864	....	Unsafe for drinking purposes.
10	Cummings, Wm.	Hallville, Ont.	Sept. 15	·02	·11	7·62	86·0	797·0	542·0	255·0	.....	.....	....	Shows contamination. Dangerous to use.
11	Ross, H. C.	Cummings' Br., Ont.	" 15	·03	·175	·041	·8	326·0	262·0	64·0	1·188	2·344	.....	No sewage pollution.
12	Hunt, Richard	Summerside, P. E. I.	" 10	·004	·198	4·71	24·0	216·0	114·0	102·0	·060	·132	Traces	Not first-class. Too much organic matter.
13	Hunt, Richard	" "	" 10	·05	·032	3·13	32·0	238·0	150·0	88·0	·492	·906	"	A "fair" water.
14	Hunt, Richard	" "	" 10	·056	·12	6·10	96·0	548·0	450·0	98·0	·548	1·132	"	Suspicious and probably dangerous.
15	McGregor, Wm.	Windsor, Ont.	Oct. 6	·03	·135	·041	2·5	115·2	95·2	20·0	·240	5·80	"	Not first-class.
16	McGregor, Wm.	"	" 6	·032	·09[illegible]	·0527	2·4	136·0	114·0	22·0	·232	·580	"	"
17	McGregor, Wm.	"	Nov. 15	·14	·14[illegible]	·054	2·8	126·0	100·8	25·2	·428	·804	h. traces	Not a safe water. Sewage pollution indicated.

I am led to believe that more attention is now being paid to the purity of the water supply on farms than heretofore, but it still seems necessary to emphasize the danger that exists in drinking (or using for cattle) water contaminated with sewage.

The practice of digging the well where it may act as a cesspool to the stable, barnyard or privy is most reprehensible, and, I am sorry to say, has not yet been discontinued in some parts. In light, sandy soils the distance that such drainage will travel has been proved to be much greater than is ordinarily supposed.

That continued sickness in a family, and more especially typhoid fever, diarrhœa and diseases of an allied character, is often due to water receiving excremental filth I have been repeatedly able to show.

The necessary instructions for taking and shipping samples of water for analysis are sent to farmers on application.

EXPERIMENTS TO ASCERTAIN THE VALUE OF DILUTE SULPHURIC ACID FOR CHECKING THE SPROUTING OF POTATOES.

The quality of potatoes for culinary use is seriously affected in spring by sprouting. Despite great care, this often takes place, materially deteriorating the value for table use of large quantities of potatoes annually.

A statement has been widely circulated of late in the press of Canada setting forth a so called successful treatment for the prevention of this sprouting. This treatment consists in immersing the potatoes in a two per cent (2 per cent) solution of sulphuric acid (oil of vitriol)for some time, and then rinsing with cold water. This, it is claimed, will effectually prevent the "eyes" from sending forth shoots.

In order to ascertain the validity of this statement, a series of experiments was inaugurated in the spring of the present year, with the following results:—

EXPERIMENT 1, February 25th, 1892. Variety of potato, Early Ohio. The potatoes showed no signs of immediate sprouting and were in good condition. They were immersed in a solution of sulphuric acid of the recorded strength, in which they were allowed to remain 17 hours. The potatoes were then rinsed with cold water, spread out to dry and put in large, wide-mouthed glass bottles.

Result.—On standing, the potatoes became covered with pink spots, or patches, which after a few days shrivelled. Decomposition soon set in at these places. After about two weeks a few of the eyes began to sprout. On cutting the potatoes, litmus paper showed that the acid had thoroughly permeated the tuber. The appearance of the potatoes was entirely destroyed for market purposes.

Variety.—Chicago Market. Treated as above throughout.

Result.—The potatoes were more shrivelled than the Early Ohio. Many of the eyes were deeply pitted and decomposed, yet one or two, apparently unaffected, sprouted after two weeks. Examination showed that the acid had completely permeated the tissue of the potato. The potatoes were not fit for use.

EXPERIMENT 2.—Variety, State of Maine. Immersed for four hours in the acid solution. Subsequent treatment was identical with that in the former experiment.

Result.—Potatoes became slightly pitted with pink spots. Sprouting greatly retarded, but beginning after nine days.

EXPERIMENT 3. Variety, Beauty of Hebron. Immersed for two hours. Subsequent treatment, the same as before.

Result.—Potatoes showed a few pink spots upon drying. Sprouting evidently retarded, but beginning after one week.

EXPERIMENT 4.—Variety, Empire State. Immersed for one hour. Subsequent treatment, the same as before.

Result.—Potatoes but very slightly affected by the acid; sprouted readily.

EXPERIMENT 5.—Variety, Thorburn. Immersed for twenty minutes. Subsequent treatment, the same as before.

Result.—Potatoes were not apparently affected by the acid; sprouted readily.

Summarizing these results we find that immersion for 17 hours did not kill all the eyes, though the potatoes as a whole were much affected by the acid, destroying them entirely for table use. Immersion for 4 hours injured the potatoes somewhat, but sprouting, though retarded, finally set in. Treatment for 2 hours but slightly affected the appearance of the potatoes, but was valueless in preventing sprouting. Shorter periods of treatment did not injure the potatoes, but the acid was then not efficacious in killing the eyes. Sprouting took place after 20 minutes immersion as readily as in untreated tubers.

Conclusion. Under the conditions stated above, there can be no doubt that 2 per cent sulphuric acid is valueless in preventing the sprouting of potatoes.

In these experiments no effort was made to preserve the treated potatoes from the light; future trials will be made in order to ascertain to what extent light is instrumental in promoting the sprouting of treated potatoes. It is also proposed to treat the potatoes in the autumn instead of in the spring, as it is possible that the eyes would then be more easily killed.

MERCURIC CHLORIDE (CORROSIVE SUBLIMATE) AS A FUNGICIDE.

Some months ago the editor of the "Canadian Horticulturist" forwarded to the Central Experimental Farm, Ottawa, a letter from one of his correspondents who asked of what value this chemical was as an insecticide and fungicide? We had had no experience with it, nor could any literature on the subject be found. With a view, therefore, of obtaining an answer to the question, a series of experiments was inaugurated, the results of which are here given. These experiments have necessarily been of a preliminary character, but they have given some interesting results and serve to indicate the direction for future work.

One of the essential characteristics of a successful fungicide or insecticide is that it shall not be injurious to the foliage to which it is applied. The first step therefore was to investigate the effect of solutions of corrosive sublimate of different strengths on the foliage of certain plants and trees.

Mercuric chloride is a white, crystalline salt, soluble in about fourteen (14) times its weight of cold water. In its physiological action it is "corrosive, irritant and highly poisonous." These properties would lead us to suppose that solutions approaching saturation would be highly injurious to foliage as well as destructive to insect life. It is an antiseptic of great value, and its well known power in preserving animal tissues from the growth of moulds and bacteria would suggest it as a useful agent in destroying or preventing the development of parasitic fungi.

Solutions of two strengths were made and experimented with.

A.—1 part of corrosive sublimate to 1,000 parts of water by weight (2½ drm. to 1 gall.)

B.—1 part of corrosive sublimate to 2,000 parts of water by weight (1¼ drm. to 1 gall.)

First Series of Experiments :—

The following plants were selected, Hydrangea, Abutilon, Coleus, Geranium and Fuchsia, which at the time of experiment were in the green-house. An atomizer, which made the solution as fine as mist, was employed for the spraying.

Hydrangea.—Sprayed with solution A. Shortly after drying it was noticed that both leaves and flowers were becoming brown. The sprayed parts soon shrivelled and died, presenting in the course of a few days a burnt or scorched appearance.

Solution B was then tried. On drying from the first application, no injury was apparent. The plant was then sprayed a second time—the foliage in the interim not having been watered. Patches of small brown spots now appeared on the leaves a short time after drying. The life of the sprayed leaf was not however visibly affected.

Abutilon.—Sprayed with solution A. Small brown patches appeared after second spraying, but the vitality of the leaves appeared to be unimpaired.

With solution B. No injury could be detected until about one week after second spraying (ten days after first application), when a few brown, film-like spots appeared; otherwise the leaves were healthy and vigorous.

Coleus.—Sprayed with solution A. The leaves soon showed signs of scorching, the injury extending to the destruction of the cell substance. Death of the treated leaves and their falling off soon followed.

With solution B. The leaf was injured by the first application, though not seriously. After the second spraying, at an interval of three days, the injurious effect of the corrosive sublimate was more apparent. Sprayed parts finally died.

Geranium.—With solution A. Almost immediately on drying the foliage became brown, as if the leaves had been badly scorched. The leaf shrivelled, died and dropped in the course of a week.

With solution B. Very little injury appeared at first, but after the second application the injury was most marked. The sprayed foliage eventually died and dropped.

Fuchsia.—Sprayed with solution A. Very slight injury, if any, could be detected—even after several sprayings.

With solution B. The leaves appeared perfectly healthy and normal after repeated applications.

Second Series of Experiments:—

The effect of the trial solutions was then ascertained on the foliage of certain fruit trees, as follows: Apple, pear, plum and cherry. These were all young trees, from four to six feet high, and were in nursery rows. They were all sprayed twice with both solutions (A and B), an interval of three days intervening. No injury to the foliage resulted in any case.

As an Insecticide:—

As the thin film of poison would lie on the surface of the leaves, we should expect it to be most efficacious in the case of those insects that eat away the substance of the leaf. To those, like the plant lice, that pierce the epidermis and suck the juice it could only act as an irritant (perhaps to the extent of destroying) at the time of spraying. A colony of mealy-bugs was sprayed several times, but only succumbed after prolonged treatment.

No experiments have as yet been made to test the efficacy of corrosive sublimate directly as a fungicide, a suitable opportunity not having offered itself.

Conclusions. With the limited data at our command it is not advisable to speak too definitely as to the future usefulness of this compound as an insecticide and fungicide. Some inferences, however, may, I think, safely be drawn. The foliage of different plants evidently varies widely in ability to withstand the corrosive action of this compound. A solution which is very injurious to one plant is often quite harmless to another. The green-house plants, with one exception, were all affected by solution B (though some, not disastrously so), while the fruit tree foliage was uninjured.

From the properties of this salt (corrosive sublimate) and the result of our work, I am, however, not hopeful for its success as an insecticide. I do not think it can safely be applied in solutions sufficiently strong to act in this rôle.

I am more sanguine for its usefulness as a fungicide, and future experiments may show that solutions even more dilute than "B" may be used to advantage in checking or destroying fungus life.

REPORT OF THE ENTOMOLOGIST AND BOTANIST.

(James Fletcher, F.R.S.C., F.L.S.)

W. Saunders, Esq.,
Director, Dominion Experimental Farms,
Ottawa.

Sir,—I have the honour to hand you herewith a report upon some of the more important subjects which have been brought under my notice officially during the past season. The only new insect pest of importance which requires special mention here is the Cattle Horn fly (*Hœmatobia serrata*, R. Desv.), upon which under your instructions I prepared a bulletin (C. E. F. No. 14) in September last. This has been distributed to our correspondents both in English and French, and I trust that the farmers of Canada will recognize the great importance of using every effort to stamp out this small but formidable foe. Enquiries concerning insects, for the most part this year, have been with regard to enemies of field and fruit crops. In the division of Botany, some interesting experiments have been carried out as to the best means of preventing loss from the disease known as Potato-rot. The collection in the Botanic Garden has been increased by about fifty species, chiefly willows, poplars, oaks and birches. A border for perennials has also been begun, and clumps of about forty of our native Michaelmas-daisies, golden-rods and other plants have been established. Large numbers of specimens have, as usual, been sent in for identification, both of insects and plants.

Field Crops.—Cereal crops have on the whole been somewhat freer from insect attacks than usual. The Hessian Fly and the Wheat-stem Maggot were sent in from a few localities. In the Ottawa district the former was sought for carefully, but in vain. Last year, through the kindness of Professors Riley and Forbes, I was favoured with a consignment of Hessian Fly "flax seeds" infested by a parasite which has done good service in Europe by reducing the numbers of this often undetected foe. These arrived in good condition, and were liberated at Ottawa in a field known to be infested. Although no specimens could be found of the parasite or its host, I am still hopeful that the parasite may have established itself, and that the benefit of the experiment may become evident later. The strange injury to oats by the common Red-legged Locust (*Melanoplus femur-rubrum*, De G.), which has been frequently noted, in which the flowers and grains are cut off from the panicles and dropped to the ground, has been again reported by the Hon. G. W. Allan, from his farm near Barrie, Ont. Grain crops were somewhat injured in eastern Ontario by the Devastating Cut-worm (*Hadena devastatrix*, Brace). Corn was less attacked, as far as I have received reports, than for many years previously. The only cut-worm that was sent in frequently was the Red-backed Cut-worm [*Agrotis* (*Carneades*) *ochrogaster*, Guen]. I was able to clear up part of the life history of this species during the past season. Eggs laid by a female caught in the field during October, 1891, hatched only on April the 20th following. These were full grown, and pupated June 10th, the first moths appeared July 20th. This is a large caterpillar, exceeding $1\frac{1}{2}$ inches in length when full grown, and attacks almost all succulent vegetation.

The Pea-weevil has been unusually destructive, and were it not that there was a larger acreage than usual put in to this crop, there would have been a considerable shortage in Ontario. Bean plants in most districts were severely injured by Anthracnose [*Colletotrichium Lindemuthianum* (Saccardo and Magnus) Brios. and Cava.], and experiments were carried out by Mr. Craig on the beans grown in the horticultural

department, with a view of discovering a remedy. These will be found in his report on page 104.

Root maggots of cabbages, onions, radishes and turnips have been, perhaps, the most troublesome pests of the year. For garden application Hellebore tea and Kerosene Emulsion applied at the roots have been successful, but for field practice no adequate remedy has so far been discovered.

The Colorado Potato-beetle (*Doryphora 10-lineata*, Say) made its appearance as a serious pest of potatoes in Nova Scotia and Prince Edward Island. Paris Green is undoubtedly the best remedy for this enemy, and, when it is used with proper care, no danger of poisoning need be apprehended. It is poisonous, of course, very poisonous; but so are many other substances which it is necessary to use. No possible ill results to human beings can follow its use upon plants, from their absorbing its poisonous principles into their tissues. A predaceous bug (*Podisus cynicus*, Say), which was found feeding upon the Colorado Potato-beetle, by Mr. A. J. McNeill, of Little Sands, P.E.I., was also sent to me by correspondents at London, Toronto and Ottawa.

Turnips were comparatively little injured by the Flea-beetle; but late in September the Turnip Aphis (*Aphis rapæ*, Curtis) made its appearance in a few localities in alarming numbers; specimens were received from Prince Edward Island, Quebec and Eastern Ontario. Turnips on the Central Experimental Farm were brought to me on the 4th of November, which had been heavily infested, but the pests had been entirely destroyed by the fungus *Empusa aphidis*, Hoffm., the whitened and swollen dead bodies being in conspicuous masses at the bases of the leaves.

The Zebra caterpillar of *Mamestra picta*, Harr., was very numerous in the vicinity of Ottawa. It appears to be literally omnivorous, attacking plants of all orders. It was very destructive to young spruces, asparagus and peas, cabbages, clovers, etc., and was sent in several times as an enemy of potatoes. Late in the season, as recorded further on, the eggs were largely destroyed by parasites.

The Celery caterpillar, *Papilio Asterias*, Fabr., was sent in from various places in Ontario and Quebec, where it was destructively abundant upon celery, carrots and parsnips. Of those bred, most of the specimens were found to be parasitised by the Ichneumon fly *Trogus exesorius*, Brullé.

A caterpillar which occurred in undue numbers all through the eastern portions of the Dominion was the so-called "Salt-marsh Caterpillar" (*Leucarctia acræa*, Dru.) This insect is widely distributed and occurs all over Canada. The caterpillars, known as "Woolly Bears," feed upon most low plants, and are occasionally, when abundant, injurious in gardens to beans, lettuce, cabbage, etc.; but their favourite food plants seem to be useless weeds, such as lamb's quarters, dandelion, etc. A consignment of caterpillars sent to me by Mr. C. H. Wright, of Middleton, Ont., was found to be infested with the infectious fungous disease *Empusa grylli*, Fres., var. *aulicæ*. Experiments made with the object of propagating this disease apparently failed.

Fodder Crops.—Hay and all fodder crops were excellent in most of the provinces, the spring having been exceptionally favourable. Grass insects received some attention. The injury known as "silver top" was remarkably prevalent, and is due to several insects, principally, I think, as suggested by Prof. Osborn, to small leaf-hoppers, perhaps also to a Thrips, and also in the stems of some of the larger grasses to the Wheat-stem Maggot. In the experimental grass plots, the larva of *Hydræcia cataphracta*, Grote, the Tomato-stem Borer, was very abundant in the young stems of *Phalaris arundinacea* and *Elymus Canadensis*. The same caterpillar was also more than usually destructive, burrowing in the stems of many herbaceous plants, such as tomatoes, potatoes, lilies, sunflowers, &c. There was doubtless much unrecognized injury to grass lands from the attacks of the Devastating Cut-worm and the American Frit-fly underground, and a true Thrips upon the leaves. A severe attack upon marsh grass lands by an insect which has never before, in my experience, been noticeably, injurious, was that of *Ctenucha Virginica*, Charp., which was reported to me by Mr. Amos Vernon, of Minudie, N.S. The caterpillars are interesting, from their very different colouration during the last moult, when they are

yellowish white, and the preceding ones, when they are black and white, with yellow ornamentation.

Fruit Crops.—There has been as usual much inquiry with regard to the common pests of the orchard and garden, such as the Tent Caterpillars, the Oyster-shell Bark-louse, the Red-humped Caterpillar of the Apple, the Woolly Aphis, the Grape-vine Leaf-hopper, and the Cherry-slug.

The Eye-spotted Bud-moth did not occur nearly so widely nor so abundantly as last season. The Cigar Case-bearer, mentioned in my report for 1891, at page 196, has been named by Prof. Fernald, of Amherst, Mass., *Coleophora Fletcherella.* This insect which was first sent some years ago from Prince Edward Island and New Brunswick, appeared in enormous numbers in 1891 in the orchard of Dr. D. Young, at Adolphustown, Ont. Dr. Young has carried out careful spraying experiments both with hot and cold Kerosene Emulsions and different strengths of Paris Green He has found this a difficult pest to eradicate, but has succeeded best with the Kerosene Emulsion used in spring when the caterpillars are active. An outbreak of the Apple Bucculatrix at St. Catharines, Ont., was kindly brought to my notice by Mr. W. J. Hambly, of the Toronto *Mail*, and specimens of twigs from infested trees, which have been sent to me, without any letter, show that the insect occurred in very great numbers. From specimens received, coming from widely separated districts, I fear that the Pear-leaf Blister is spreading. The almost invisible elongated white mites which cause the blisters on the leaves, pass the winter in the scales of the buds of pear trees. The best remedy is to spray infested trees, just as the buds are opening, with Kerosene Emulsion.

A new attack of some interest upon apple buds and blossoms is reported from Nova Scotia by Col. Wm. M. Blair, Superintendent of the Experimental Farm, at Nappan, N.S. This is by the click-beetle, *Corymbites caricinus*, Germ. I have, on two occasions previously, received these beetles from Nova Scotia as occurring upon apple blossoms, but with no statement as to their injuries. Col. Blair, however, writes to me on the 1st of June: "I send you herewith some beetles which are destroying the foliage of our trees. They are on every tree in hundreds and seem to suck the leaves as soon as they appear. They fall to the ground at the slightest shake. When the flowers open, they attack those also, and many other plants and shrubs, in fact, they are on almost everything that has a leaf." Prompt spraying with Paris Green was recommended and the collection of the beetles by beating the foliage over a beating-net or an inverted umbrella.

The enemies of the grape-vine were abundant in western Ontario, but their attacks were most noticeable upon the Virginian Creeper (*Ampelopsis quinquefolia*). The caterpillars of the Beautiful Wood-nymph and the Lesser Grape-vine Sphinx in many places, stripped this ornamental creeper of its foliage; both, however, were much reduced in number by parasites.

The Raspberry-cane Girdler (*Oberea bimaculata*, Oliv.) was the chief enemy of the raspberry in the Ottawa district, and specimens of its work came in from other parts of Ontario and Quebec.

Paria sex-notata was again this year a most serious pest of raspberries at St. Catharines, Ont. Mr. Martin Burrell writes: "My old enemy *P. sex-notata* has revisited me this spring in greater numbers than ever. I sprayed with Paris Green, 4 ounces to 40 gallons, but the foe still 'bobbed up serenely.' Of a quarter of an acre of my raspberries not a score of canes have leafed out. I am not the only victim this year, as several of my neighbours have been seriously injured by the beetles." This insect, like the Rose-beetle (*Macrodactylus subspinosus*, Fabr.), appears to be very difficult to treat, even Paris Green having much less effect than much milder poisons with other insects. It is the perfect insects which destroy the young growth at the time of flowering. The grub passes its life under ground, living upon roots.

Red and white currants, where neglected, have been defoliated by the Imported Currant Saw-fly. Paris Green early in the season and White Hellebore after the fruit has formed are safe and effective remedies. Fruit infested by the Currant Weevil (*Anthonomus rubidus*, Lec.) was sent by Mr. W. S. Duggan, from Murray Bay, Que.,

where it had reduced largely his crop of red currants. This weevil can generally be found every year at Ottawa in small numbers but nearly always in white currants. All infested fruit ripens before the main crop and should be destroyed before it drops from the branches.

Forest Trees.—The most noticeable attack of the year to forest trees was by the Fall Web-worm (*Hyphantria cunea*, Dru.) and where the webs were not removed upon their first appearance in August, at which time it would have been an easy matter, the disgusting webs filled with excrement, remain as unsightly witnesses of negligence. *Lophyrus abietis.* Harr. the Spruce Saw-fly, attacked Norway spruces in Winnipeg and western Ontario. It was also injuriously abundant upon native spruces in the Muskoka district. The Larch Saw-fly, *Nematus Erichsonii.* Hart., continues its ravages in the tamarack swamps of Ontario, Quebec and the Maritime Provinces. Already thousands of acres of native larch have been killed. Two other imported saw-flies are now being studied at Ottawa, where they have developed during the last four years as serious pests. *Fenusa varipes*, St. Farg. (*melanopoda*, Cam.) and *Nematus pallidiventris*, Fallen. The former of these is a small black saw-fly, $\frac{1}{8}$ of an inch in length or a little more, which inserts its eggs beneath the epidermis of the upper surface of the young leaves of the European alder. The larvæ mine within the leaves and give them a very blotched and withered appearance. When full-grown, they eat their way out and fall to the ground, beneath the surface of which they pass the pupal stage. There are two and perhaps three broods in the season. So far no parasites have been detected. Owing to their habit of feeding within the leaves a practical remedy is difficult to devise. *Nematus pallidiventris* is a species found in Northern Europe and was probably introduced with willows from Russia. In all its stages it somewhat resembles the Imported Currant Saw-fly and is easily checked by spraying with Paris Green.

Weeds.—There has been much correspondence on this important subject, of which I treated at some length in my last report. The most serious imported agricultural pest is a member of the Mustard family. *Sisymbrium sinapistrum*, the "Tumbling Weed" of the settlers around Indian Head, N.W.T. This is a large coarse annual or biennial, according to locality. In Europe, where it is native, it is, according to D. Rapin, an annual in the valley of the Rhône, and, according to Dr. M. Seubert, a biennial in the valley of the Rhine. The same difference exists in Canada; a plant observed on a railway bank at Ottawa passed the winter and threw up its flowering spike in June. In the North-west, however, it is a true annual. Mr. Mackay writes: "It starts in the spring from seed, and if let alone, will ripen its seed at the same time as mustard, or about wheat harvest. If cut off above the ground, it will throw out shoots, which, if let alone, will ripen seed before frost comes, if the first cutting is early enough. If not, the shoots will go on growing until the first frost destroys it. It does not start in the spring from the autumn growth, as you suggest, for that is entirely dead. One seed produces one stock which lives and dies the same season." The normal size of this plant in Europe is about two feet high, but a large specimen sent to me entire by Mr. Mackay for the purpose of counting the seeds was more than twice that height, with numerous branches covered with long pods. All of these were counted: each pod contained an average of 120 seeds in two ranks and gave the enormous total of one and a half millions of seeds from the one plant. These when threshed out weighed 150 grammes (nearly $5\frac{1}{2}$ ounces.) The seeds are very small, about half the size of the seed of timothy, and dark reddish brown in colour. There is no doubt but the introduction of this pernicious weed into the North-west Territories is a most serious matter, and it is gratifying to know that farmers there are paying so much attention to this subject and using every effort to stamp out noxious weeds. The large number of specimens which have been sent to me for identification by farmers, weed inspectors and others, are proof of this.

Of plants which have developed locally as aggressive weeds, in addition to the above, the following may be mentioned, and tend to show that almost any plant under special circumstances may become a troublesome pest: *Camelina sativa*, *Neslia paniculata*, *Iva xanthiifolia*, *Iva axillaris*, and *Corydalis aurea* in Manitoba;

Cuscuta trifolii, from Ashcroft, B.C., and from western Ontario, *Hieracium aurantiacum*, extending from the Eastern Townships into Vermont, and *Lepidium campestre*, from Stoney Creek, Ont.

The subject of "Loco" weeds has been brought forward by the poisoning of sheep and lambs in Manitoba, but no specimens were forwarded, and nothing definite was ascertained. It would be well if the owners of sheep runs would send specimens of any plants belonging to the Pea family with upright (not creeping) stems which they may find on the runs, when sheep have been poisoned.

Meetings.—I have during the year attended five Farmers' Institute meetings, at Cowansville, Que., Brantford, Picton, Carp and Galetta, Ont. At the request of the Hon. Minister of Agriculture and Arts of Ontario, I attended a meeting of a committee of the Provincial Legislature, and gave evidence as to the best time to spray fruit trees to destroy insect pests, without running the risk of poisoning bees, which are of so much importance to fruit-growers in fertilizing blossoms, as also of course in making honey.

Acknowledgments.—I beg again to express my thanks to many who have rendered me valuable assistance in making observations and sending me prompt notice of the occurrence of injurious insects and fungous pests. I wish particularly to acknowledge my indebtedness to Prof. C. V. Riley, Dr. George Vasey, and Mr. B. T. Galloway, of Washington, and Prof. John Macoun, of Ottawa, for many favours in the identification of specimens and for the loan of illustrations; also to Dr. J. Hamilton, of Allegheny, Pa., for the identification of coleoptera, and Prof. Byron D. Halsted, of New Brunswick, N.J., of fungi.

Donations have been received from the following:—

Prof. John Macoun, seeds of native plants.
T. N. Willing, Calgary, N.W.T., seeds of native plants.
W. E. Saunders, London, Ont., specimens of native plants.
W. Scott, Ottawa, specimens of native plants.
J. Dearness, London, Ont., specimens of native plants.
Dr. J. E. White, Toronto, collection of roots of native plants.
J. R. Anderson, Victoria, B.C., collection of roots of native plants.
Prof. W. J. Beal. Agricultural College, Mich., grass seeds.
J. S. Pearce & Co., London, Ont., grass seeds.
Sutton & Sons, Reading, England, grass seeds.
Vilmorin, Andrieux & Co., Paris, France, clover seeds.
Hon. C. F. Cornwall, Ashcroft, B.C., roots of *Lewisia rediviva*.
J. B. Olcott, South Manchester, Conn., fine sod of *Festuca*, Olcott No. 1.
W. H. Holland, Norquay, Man., root of *Physalis grandiflora*.
Pro. H. Garman, Lexington, Ky., seed of Kentucky grown *Poa pratensis*.
R. E. Purver, Riverside, B.C., specimens of insects.

On April 11, Mr. J. A. Guignard, B.A. and B.L., B. Sc. of the University of France, was appointed Assistant Entomologist and Botanist, and with his valuable assistance, I am gradually clearing off the large amount of back work which had accumulated during the past four years. Mr. Guignard's knowledge of European languages, added to his scientific attainments, has rendered his appointment one of much value in the successful conduct of my department.

I have the honour to be, sir,

Your obedient servant,

JAMES FLETCHER,

Entomologist and Botanist.

DIVISION OF ENTOMOLOGY.

THE HOP-VINE BORER, "THE COLLAR-WORM OF THE HOP."

(*Hydrœcia immanis*, Guen.)

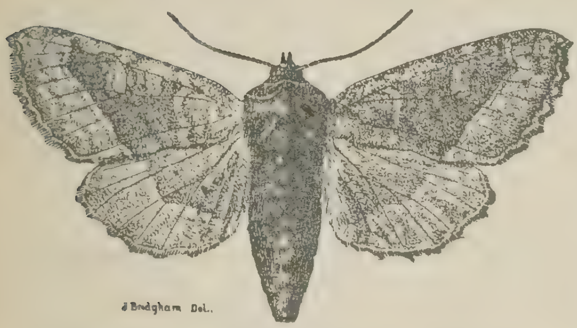

Fig. 13. The Hop-vine Borer. *Hydrœcia immanis.*

Attack.—Small slender caterpillars, about ½ inch in length, marked with chocolate brown bands of large irregular spots on a whitish ground, separated by a narrow white dorsal, a double lateral and an infrastigmatal clear white line. Head white, thoracic shield, anal shield and the legs dark brown. These are found burrowing in the leading shoots of hops early in June. Later, the same caterpillars are found just beneath the surface of the ground, attacking the bases of the annual stems at the collar, where they spring from the root stock. The larvæ are, when full-grown, large fat caterpillars, 1¼ to 1¾ inches in length, of a dirty white colour, with reddish-brown heads and having the body spotted with black bristle-bearing tubercles. The dark bands which were conspicuous in the young larvæ are now almost obliterated and quite so in some specimens.

In June, 1889, my attention was drawn to this insect by Mr. Wellington Boulter of Picton, Ont.; and from several hop growers, I learnt that the ravages in some sections of Prince Edward County were considerable every year. Since that time and with the assistance of Mr. S. J. Cotter, Secretary-treasurer of the Dominion Hop-Growers' Association, I have worked out the life history of this pest.

The first notice I find in literature of the Hop-vine Borer is by Dr. Bethune, in the Report of the Entomological Society of Ontario for 1872, page 33, where a detailed description is given of some larvæ which were found injuring hops by gnawing the stems at the crown. Canadian entomologists have from time to time tried to identify that insect. I have now no doubt that the larvæ described were of *H. immanis.* In the *Canadian Entomologist*, vol. XIV, 1882, p. 93, is an interesting article by C. R. Dodge, entitled "The Hop-vine Borer," in which the author describes correctly the habits of the larvæ and gives much valuable information with regard to the injuries committed by them. Mr. Dodge does not give the name, but unhesitatingly pronounces it to be identical with those described by Dr. Bethune. Dr. Lintner in his Second Report, 1885, p. 41, says of this insect: "Our first knowledge of its true character was that obtained from Prof. J. H. Comstock, who at the annual meeting of the Entomological Society of Ontario, held at Montreal during the meeting of the American Association for the Advancement of Science, in August 1882, exhibited several examples of the insect, which he had succeeded in breeding from the 'Hop-grub.' We know of no publication by Prof. Comstock of his study of this insect."

In Bulletin 4, Division of Entomology, Prof. J. B. Smith, published an extensive report of some observations made by him in New York State, under the direction of the Entomological Division of the United States Department of Agriculture.

Prof. Lintner in his article above referred to, which appeared in 1885, reproduces the salient points of previous records, and also adds some further notes of interest.

The ravages of this insect have been long known to hop growers in New York and New Jersey States, as well as the main features of its life history.

It is, however, by no means a common insect in Canada. The moth occurs rarely at Ottawa, and I have specimens from Toronto and London, Ont. The larvæ are described by Dr. Bethune as occurring in large numbers at Erindale, Credit, Ont. In Prince Edward County, where the cultivation of the hop has become an important industry, this enemy has been allowed to increase so much that it is now a serious drawback to the lucrative cultivation of the hop.

"*August 4th.*—I enclose you some objects which I find down in the ground in my hop hills. What are they, and what will they bring forth? The grubs in my hop-yard are very numerous, and doing a great deal of damage. Please give any information you can."—JAMES CRAWFORD, *Bethel, Ont.*

The objects sent by Mr. Crawford were the chrysalides of *H. immanis*, from which I bred some moths, and one specimen of *Ichneumon jucundus*, Brullé.

Life-history.—The eggs are greenish white, rounded above, flattened beneath, finely striate from the apex to the base. They are laid singly on the young shoots of the hop as soon as they appear above the ground. The growth of the shoots is very rapid at this time of the year, and they are about 3 feet high before the work of the young caterpillars is noticed.

The young caterpillars are very slender, pale in colour, with dark longitudinal lines, and dotted with black bristle-bearing tubercles. They at once eat their way into the vine and stop its growth, causing what are known as "bull-heads," among the hop growers of Prince Edward County, but "muffle-heads" in New York State, according to Prof. Smith. The cause of these bull-heads is, the central shoot being destroyed, growth is checked for a time, but two shoots are produced from the joint next below the injury. When the caterpillar is about half an inch in length it eats its way out of the shoot and lets itself down to the ground, and Prof. Smith states, "entering the stem at the surface of the soil feeds upwards, interrupting the growth of the vine and lessening its vitality. The larva now changes colour, and becomes dirty white with a strong deep reddish tint, apparently proceeding from beneath the surface of the skin, and with numerous black spots. As the vine grows, it becomes hollow and hardens, and the more rapidly as the free flow of sap is interrupted. The larva, now about an inch in length, and still slender, burrows downward to the base of the vine at its junction with the old stock, and eating its way out completes its growth as a subterranean worker. It is in this state that it is best and most widely known as the hop 'grub,' and the ravages caused by it are the most noted." (U. S. Div. of Ent., Bul. 4, p. 35.)

According to Mr. Cotter's observations, the young caterpillars for the most part, leave the tips of the vines before the end of May, but occasional specimens may be found in the tips, even to the middle of June. They become full grown by the first week in August, so that for two months these larvæ are a constant drain on the vitality of infested plants. The injury to the stems by the large caterpillars is apparently, in comparison with their size, small. A wound is eaten into the side of the stem; the caterpillar lies in the ground close to this, and must, I judge, subsist almost entirely upon the sap. When full fed it assumes the chrysalis form in the ground close to the roots of the hop plants. This is from 1 to 1¼ inches in length, dark brown in colour, elongated and heavy in shape, with a double spine at the blunt posterior end. It remains in the chrysalis condition from five to seven weeks, and the moths are found on the wing during September and October. They pass the winter in a torpid state, probably beneath leaves and rubbish. Several specimens kept alive in a breeding cage remained constantly on the bottom and took advantage of any small object to hide beneath it. The moth itself, although very inconspicuous when on the ground or among leaves, is a beautiful creature when examined closely, from the contrast of the shades of colour and the velvety appearance of the central area of the wings. The moth measures 1½ to 2¼ inches across the expanded wings. The general colour is a rosy brown, which is paler at the extremities of the wings; the central portion is much darker, being shaded with dark velvety bronze, and is marked with two large pale spots known as the orbicular and reniform. The fore wings are divided into three areas by narrow, oblique, transverse lines, edged exteriorly with pale pink. The hind wings are paler in colour, crossed in the middle by a slightly darker line. The sexes are similarly marked, but can be distinguished by the larger abdomen of the female and a conspicuous fan-shaped brush at the extremity of the abdomen of the male.

This moth has been placed in the three different genera, *Gortyna*, *Apamea* and *Hydrœcia*, by different writers. Prof. Riley writes me lately: "As regards *immanis*,

I think that we should follow Prof. Smith's new catalogue in retaining it in *Hydrœcia*. I have always referred it to this genus." In view of this opinion, I have therefore used that generic name. This question is discussed at some length by Prof. Lintner in his First Report, page 115.

Remedies.—It will probably be found that the most effective remedy is the collecting by hand and destroying the young grubs before they leave the tips of the vines. An attacked shoot has a characteristic appearance which is recognized at sight by an experienced eye. When thinning and tying the vines such can be easily removed and the young caterpillar destroyed by crushing it. In Prince Edward county this must be done before the last week in May, and as the vines have to be trimmed and the shoots chosen for tying to the poles about that time, very little extra labour will be entailed.

Mr. Dodge, in his article above referred to, says as follows:—"Next to the crushing process, a useful remedy is to hill the hops as soon as possible and give the yard a thorough cultivation. The hilling causes fibrous roots to put out above the operations of the grub and save to some extent the crop." On the other hand, he speaks most highly of a method recommended by a New York grower of hoeing away the earth from the vines about the first of June, applying fertilizers to the roots and not hilling up till the end of July. Prof. Smith recommends this same treatment of exposing the roots, but says that five or six days, early in June, will be a sufficiently long time. The idea of baring the roots is to render them harder and more unattractive to the caterpillars, while hilling them up is to induce a free growth of secondary rootlets to repair injury and strengthen the vines.

I hope to induce some of our Canadian hop-growers to try careful experiments with different methods of treatment next year. At a meeting of the Dominion Hop-growers' Association, which I attended at Picton, Ont., in May last, I learnt that a kind of herring which is thrown up in large quantities on the lake shore, had been used as a fertilizer for hops, and that where this had been done the Collar-worm was far less abundant. On this point Mr. Cotter writes to me, Dec. 22nd:—"With regard to fish as manure for hops and to prevent attacks of the Collar-worm, Mr. Mathew Benson, ex-president of our association, tried it, and he believes it is a success. I have also tried ashes, and believe, as Mr. Benson does, that they are good—ashes in the fall, fish in the spring. I would state that my crop has never been so heavy since 1885 as it was this year, but great discretion had to be exercised in applying the manures best adapted for the different soils. My advice would be: Ashes for sand and fish for heavy soils, to fight the Collar-worm and not get too much growth of vine."

"Dec. 26.—A bull-head may be made into a good runner, if required, by nipping off one shoot at the crotch. Some growers have tried fish against the Collar-worm, and they say it works well, but I have had no experience with them. Wood ashes applied in the fall before manuring are very good."—JAMES CRAWFORD, *Bethel, Ont.*

I am of the opinion that the virtue of the fish as a preventive of Collar-worm attack is due chiefly to the offensive odour of the putrefying fish at the time the young caterpillars fall to the ground to attack the root. The ashes probably act only as a fertilizer, and would not have much value as a deterrent

Mr. Dodge and subsequent writers on the Hop-vine Borer draw attention to the good services of skunks in destroying the caterpillars. Mr. Dodge says: "All growers speak most favourably of the friendly offices of these much despised animals in the hop-yard. They seem to have acquired the digging up process to perfection—far better than the hop-grower—as they are able to dig around the hills without the least injury to the vines. In Juneau County, Wisconsin, this little fellow—with an appetite for juicy grubs only equalled in degree by the pungency of his perfume—is the only positive remedy, as he works about the hop-hills or roots, cleaning out the worms in a few nights. One grower says: 'I have seen ten acres where not a dozen hills would escape their little noses.'

"It is worthy of note that in a majority of cases the growers report the borer as the most injurious insect in the hop-yard, not excepting the hop-aphis."

THE RED TURNIP-BEETLE.

(*Entomoscelis adonidis*, Fab.)

Attack.—A showy scarlet beetle with three black stripes down its back, a black patch on the collar and black legs; two-thirds the size of the Colorado Potato-beetle, but narrower in outline, eating the leaves both as larva and perfect beetle of turnips, radishes, and cabbages.

During the past season, I have received further reports concerning the injuries of the Red Turnip-beetle to turnips and other plants of the cress family in Manitoba and the North-west Territories, and I again draw attention to it, as I am convinced that unless it is watched carefully, it may, with the increased cultivation of crops suitable as its food, develop into a serious agricultural pest, in the same way as was the case with the Colorado Potato-beetle, when potatoes were grown in large quantities in the districts which were its native home. In response to a request made in my last annual report, I have received eggs and living specimens, male and female, from several correspondents and have thus been enabled to examine the larvæ hatched from some of these eggs, and observe them through all their stages.

The depredations do not appear to have been so severe this season in some of the districts where they were most serious last year.

"*August* 9.—We have very few of the Red Turnip-beetles this year."—Rev. F. R. Hole, *Minnedosa, Man.*

"*August* 29.—The beetles are not so numerous as last year. They have only worked on radishes, but I think they are going to multiply, although no eggs have been laid yet."—Joseph A. Smith, *Saskatoon, N.W.T.*

"*September* 1.—I send you by mail to-day a few Red Turnip-beetles, which have appeared on my white turnips. I have a few rows of white turnips in three different parts, within an area of four acres, and on each of the plots the beetles are to be found. Some Swede turnips are growing between two of the rows of white, but I do not find any of the beetles on these, nor upon some mangels growing alongside the turnips. The beetles seem to be the most troublesome on the driest land, and where the turnips are smallest. This would appear to be their breeding season, as many of them are in pairs."—William Lindsay, *Elkhorn, Man.*

"*September* 20.—In reading your report for 1891, I was specially interested in the account of the Red Turnip-beetle which has this year completely ruined my crop of Swede turnips. My experience with them is quite different from that of the majority of your correspondents, as my radishes which were growing only ten or twelve yards from the turnips were almost untouched; also a few rough leaved white turnips which were growing amongst the Swedes were scarcely touched. Last year I did not see one on the place. I herewith enclose what I presume are the eggs of the beetle; these I found after diligent search very lightly covered with soil. The eggs are deposited in masses slightly stuck together, but a very light shake seems to separate them. I have never seen any grubs on the turnip leaves. Is it possible that they remain under ground? Two or three days ago I noticed a gravid female crawl under a sod. I marked the spot, and this morning uncovered her; she was dead, and scattered around her were a number of eggs. In one spot there was a cluster as described above."—C. E. F. Lowe, *Yorkton, N.W.T.*

"*September* 27.—I have discovered the eggs of *Entomoscelis adonidis*, I think, by thousands. I first found them on the surface of the ground under some dried up radishes (thinnings of the crop), which had been thrown aside. Following up the clue thus given, I found them under almost any slight covering, and sometimes only under a shade which did not amount to an actual covering. I also found them a quarter of an inch or so under the surface of the ground by the roots of rough-leaved turnips and radishes. I think the eggs were not placed there, so that the young larvæ might be near suitable food on hatching, but that they are laid almost promiscuously under any slight cover or shelter. Where the beetles are plentiful the eggs are so also in proportion, and where the beetles are scattered widely apart as among grass or stubble the eggs are not found; but this is only, I believe, because the search is more difficult. The eggs are laid wherever the beetles happen to be

during the month of September and some of the females doubtless lay much earlier."—THOS. COPLAND, *Saskatoon, N.W.T.*

The above facts with regard to the egg-laying habits of this insect in a state of nature were precisely the same as I myself observed with several pairs kept in confinement for over a month upon growing turnips. Enormous numbers of the small reddish brown eggs were laid from time to time by the females, in loose masses of from 5 or 6 to 80. These were generally tucked beneath any small object on the surface of the ground or occasionally into the folds of a dead leaf on the ground. The usual habit, however, in nature is probably that the eggs are laid in clusters beneath sods or in cracks or other openings in the soil. Eggs laid in September were kept in my office quite dry until November, when they were slightly dampened, and on the second day afterwards the small larvæ appeared. This was probably due to the artificial heat of the office. In nature the eggs would not have hatched until next spring. The larvæ have fed readily upon all kinds of cruciferous plants offered to them. When first hatched garden cress was the only plant available and they took to it at once. Some seedlings of rape and the small shoots from the crowns of Swede turnips then formed their food until some radishes sown on the day the eggs hatched, were sufficiently advanced to feed them. This was for about a fortnight, since which they have been fed entirely upon radish leaves, and they seem to be perfectly healthy. They are very shy and drop from the leaves at the slightest disturbance, and this, I think, must be the reason why they have been overlooked by my correspondents.

The insect takes its scientific name *adonidis* from one of its food plants in Europe, *Adonis autumnalis*, a plant belonging to the *Ranunculaceæ*. It is, therefore, possible that it may feed naturally in the North-west upon some of the many plants of that order or upon wild *Cruciferæ*, and thus have escaped notice in the larval stage. The eggs hatch early in spring and most cultivated cruciferous crops as turnips and cabbages are not planted until long after the young larvæ would have starved on cleanly cultivated land. On wild plants the larvæ would, of course, easily escape the notice of ordinary observers, and the presence of the insect would only be recognized when the perfect beetles flew to the fields from their breeding places and began destroying the crop. When once seen the larvæ will be easily recognized by the uniform dull black colour. It is also very advisable that farmers in Manitoba and the North-west Territories should know what it looks like, as soon as possible, so as to watch it carefully and keep it in check. The same insect occurs in Europe where it has occasionally shown its powers of doing injury. Prof. Riley has kindly referred me to the literature of this subject from which it appears that the larva was reported in Hungary in 1865 as having been very injurious to rape. In a description of the larva written for the "Annales de la Société Entomologique de France," 1890, II. pp. 177-179 by P. Lesne, it is reported as injuring the same crop in Roumania as follows: "The eggs, of the form and colour of the seed of Cameline * (gold of pleasure) but smaller, are laid in autumn. The larvæ appear the following spring, soon after the last frosts, when the winter colza (rape) is beginning to germinate, that is to say, the latter half of March. Larvæ and adults are very injurious to colza in Roumania, and in certain years whole crops are destroyed by them. Unfortunately it is very difficult to fight this species, especially in countries where at the least 100 hectares (247 acres) are given to the culture of rape. Droughts favour its multiplication, while cold and rainy weather greatly retard it."

Remedy.—As soon as the beetles appear upon turnips or radishes, the foliage should be sprinkled with Paris Green and water, 1 lb. to 100 gallons. From the fact that the eggs are laid in largest numbers on land where a crop has been attacked, of course, a similar crop should not be grown there the following season. If the black elongated larvæ are found abundantly on wild plants, these should be sprayed freely with Paris Green and water.

The Egg.—When first laid, orange red in colour, turning darker gradually until it is dark brown, elongated, oblong, sometimes slightly curved, 1·30 mm. long by

* *Camelina sativa.* False Flax.

·60 mm. wide. Surface minutely granular roughened; under the microscope, closely reticulated or mottled with small white circular marks in the centre of each of which are from 1 to 7 dark brown dots of the same colour as the intervals between the circles. These circular marks are not quite close enough together to give them a polygonal appearance; they vary in size, the largest being about three times as big as the smallest. The eggs are laid in clusters loosely agglutinated together and deposited beneath clods or in crevices of the soil.

The Larva.—When just hatched, orange with black spots turning black in 24 hours, wedge-shaped, 2 mm. long, (2·55 mm. when extended); head black, ·75 mm. wide, slightly wider than the anterior segments. Each segment bears 2 dorsal transversal rows of black tubercles, from 6 to 8 in each row and each one bearing a long slender bristle, which expands into a small knob at the apex. Thoracic shield, large, covering the whole upper surface of segment 2, and bearing about 20 bristles. Just above the stigmatal line, on each of segments 3, 4 and 5, is one large dark bristle-bearing tubercle; below the stigmatal line on each side is one series of large tubercles; one on each segment, each of which bears 2 or 3 bristles. There are also 2 ventral series of rather smaller tubercles. From 9th segment, the body tapers rapidly to the end. Antennæ conspicuous, protruding beyond the cheeks.

After first moult, length 3·25 mm. (4 mm. when extended); body slug-shaped, flattened beneath, full and rounded above, not decidedly narrow at the collar as in the Colorado Potato-beetle, abruptly truncate in front, tapering behind to the prehensile bilobed anal joint. Head, sub-rotund, transverse, slightly depressed at apex. The whole body velvety black, of a reddish brown shade in some specimens, particularly beneath the spiracles, covered with transverse rows of elongated piliferous tubercles, three rows to each segment, composed respectively of 8, 6 and 6 tubercles in the first, second and third rows. Each segment is divided transversally into two folds, the anterior bearing the first two rows of tubercles and the posterior the third row. The tubercles of the second and third rows are much larger than those of the first. All the tubercles, the head, and the thoracic and anal shields, are shining black and covered closely with short blunt fuscous bristles, each tubercle bearing many bristles. Thoracic feet and spiracles, black. Underside, dull greenish black. Thoracic shield, large, covering the whole upper surface of segment 2, deeply impressed and roughened on each side. Below the spiracles is an infrastigmatal series of very large conical tubercles, and beneath this again a supraventral series, half the size of the above. On the ventral surface are five series of tubercles, the central series occurring on every segment. There is a narrow slightly depressed dorsal groove running from the apex of the head the whole length of the body, distinct and pale where it crosses the thoracic shield and the third and fourth segments.

After second moult, length 5 mm. (7 mm. when extended); ornamentation and colour, the same as in previous stage.

Mature larva, length about 12 mm. The body and appendages as described above.

After the second moult, the colour gradually changed as the larvæ matured. The ground colour above the spiracles retained its velvety appearance, but on the underside the skin seemed thinner and more translucent, the orange juices of the body showing through it and giving a dull orange hue to that portion. This was much more apparent in some specimens than in others. One or two pale specimens were distinctly bi-coloured, black above and yellow beneath; but the general appearance of the mature larva should be described as an elongated narrow grub, black above, yellowish beneath, and half an inch in length by one-eighth of an inch in width. In confinement the larvæ fed both day and night. They were comparatively active, but dropped from the food plant at a slight disturbance. Beneath segments 9, 10 and 11, counting the head as the first segment, are three pairs of small bag-like translucent extensile pseudopodia or false feet. These are used as prolegs, and appear to be extended at will from median slits in the ventral surface. In walking, these organs and the anal bilobed process are distended with the fluids of the body and seem to be of equal value in progression with he thoracic feet.

The Pupa :—length, 6 mm. by $3\frac{1}{2}$ at widest part; bright orange. The wing, leg and antenna cases, honey yellow; head, folded down on the breast. Wing cases, bearing each three longitudinal striæ. Spiracles, round and fuscous. Dorsal vessel, conspicuous as a dark stripe. Metathorax, bearing a shallow median dorsal groove. Thorax and a median transverse ridge on each segment of the abdomen, closely covered with short bristles.

When full grown, the larvæ buried themselves in the earth of the breeding jar to a depth of about an inch from the surface, and changed at once in small smooth cavities to orange pupæ, of a shape very similar to that of other Chrysomelidæ, which is well shown in Prof. Riley's figure of the Colorado Potato Beetle first published in his first Missouri Report, fig. 46 *c.*, page 101. In the pupa of *E. adonidis* the abdomen is more pointed at the apex, than shown in the figure.

In the above instance, the eggs hatched in my office on November 18th, 1892; some larvæ were full grown and buried about January 1st, 1893, and several beetles emerged January 30th.

WESTERN BLISTER-BEETLE.

(*Cantharis Nuttalli*, Say.)

Attack.—Large handsome beetles, one inch long, with plum-coloured, purple or green wing cases, glossed with gold. Head, thorax and body metallic green, with the same golden sheen as the wing cases. Feelers, dull black; legs, dark purple. These insects appear suddenly upon beans and vetches in July and devour the foliage rapidly.

Occasionally reports are received of injuries done by the above named beetle, but during the past season these have been unusually numerous, as shown by the following quotations from some of my correspondents.

"Feb. 4th.—There is in this country, a beetle varying in colour. which is blue or changing violet-green or blue with golden lustre, about an inch long by a quarter of an inch wide, which feeds on leguminous plants and is very fond of both the tender leaves and flowers of Windsor Broad Beans. I will send you specimens next summer.

"July 18.—I send you herewith a few of the beetles with their favourite wild food-plant.* They made their first appearance about July 1st. On July 4th it was very hot and they came in swarms, attacking the bloom of Windsor Broad Beans, which in some gardens they completely destroyed in a few hours. I partially saved my crop by hand-picking, gathering nearly two quarts from the beans. These beetles are sure to be a serious pest if they attack anything else.

"Aug. 22.—The season of the Cantharis is quite over now."—THOMAS COPLAND, *Saskatoon, N.W.T.*†

"July 5.—Yesterday I noticed a large number of beetles feeding vigorously on my patch of Windsor Beans. The beans were in full bloom and the insects were just beginning to feed on the blosoms. To-day, the whole patch is destroyed. I send two pairs of the insects for identification and any other information you can give me. They first devoured all the blossoms and are now feeding on the more tender leaves. I have not discovered them feeding on anything but the beans yet, but fear they may try the taste of other garden stuff. I had not seen any this year until yesterday, and although I have noticed a few in other years, they have done no damage that I have seen. Are they known to do much damage to vegetation, and if so, what is the best way to destroy them?"—GEORGE L. SMITH, *Saskatoon, N.W.T.*

"July 19.—I send you specimens of beetles which have totally eaten up some Horse Beans which were growing splendidly, and to all appearances would do well in this country and be a paying crop. But if these pests are native and likely to turn up every year, there would not be the slightest use in trying to grow them, as the beetles were literally black on the plants. Can you tell me what they are and if they are liable to come every year?"—CHRIS. HALLIDAY, *Winlaw, Assa.*

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* This was *Vicia Americana*, a wild vetch.

† Prof. Saunders found this insect extremely abundant in August upon cultivated tares growing upon the Experimental Farm at Indian Head, N.W.T. They were so numerous that the crop was materially reduced by their devastations. They were not found upon any other crop at that time.

The actual life history of this interesting insect has never been worked out, but from what is known, chiefly through the studies of Prof. Riley, of the life history of allied insects, there is every probability that during its larval state it lives on the eggs of different kinds of Locusts.

At the last meeting of the Association of Economic Entomologists at Rochester, N.Y., Mr. L. O. Howard stated that the experience of farmers in the Western States had been similar to ours, and that different species of blister-beetles had been sent to the department with reports of damage from various parts of the country. He suggested that their extraordinary abundance was probably due to the large numbers of grasshoppers last year. Prof. Forbes also said on the same occasion that some years ago in Illinois these beetles had been exceedingly and destructively abundant, following a season of great abundance of grasshoppers. Judging from the past, there is little fear, I think, that this beetle will appear in destructive numbers every year. In looking over all the reports received concerning the depredations of this insect, I find that they are all dated early in July, so that the time of injury would seem to be limited to a few weeks, and if a sharp watch were kept for its appearance, the ravages could be controlled either by sweeping the crop with a net mounted on a handle or by beating the beetles into a pan containing some water with a little coal oil on the top. Where the area attacked was too large for this, spraying promptly with Paris Green, 1 lb. to 100 gallons of water, would destroy them.

The Western Blister-beetle is hardly likely to be a general feeder upon garden produce although some specimens received living were kept alive for some time and fed upon clover and pea-vines. They did not however seem to relish these plants.

THE BIRCH BUCCULATRIX.

(*Bucculatrix Canadensisella*, Chamb.)

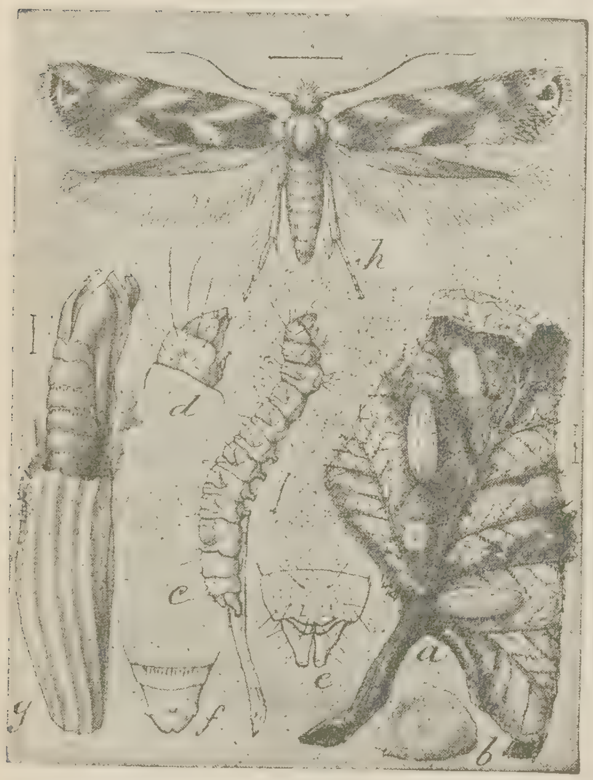


Fig. 14. *Bucculatrix Canadensisella*: *a*, part of attacked birch leaf; *b*, pseudo-cocoon; *c*, larva; *d*, head of same; *e*, anal segments of same; *f*, anal segment of pupa; *g*, cocoon with extended pupa skin; *h*, moth – all enlarged. (Kindly lent by Prof. C. V. Riley.)

Attack.—Numerous, slender pale greenish caterpillars, when full grown, $\frac{1}{4}$ of an inch in length; body, slender, tapering to each end, sparsely covered with fine bristles, the sutures between the segments deeply impressed; eating out portions of either the upper or lower sides of birch leaves, and leaving the epidermis of the opposite surface intact. The injuries become noticeable in August when the trees begin to assume a rusty or burnt appearance and many of the leaves fall prematurely. This attack may be recognized by the presence on the leaves of small white circular flat webs, which are spun by the caterpillars, as temporary shelters during the time that they are casting their skins. These have been styled cocoonets by Mr. V. T. Chambers (Can. Ent. XIV, p. 145); but are more properly called pseudo-cocoons by the Editors of *Insect Life* (Vol. V, p. 16). The true cocoons are spun later and are oblong, flattened beneath and longitudinally ribbed with about eight prominent ridges, a little over $\frac{1}{8}$ of an inch in length, of a pale greenish yellow at first, but afterwards dark brown, of the colour of the twigs, on which they may be very rarely found in winter.

For the last three years the birches of all kinds in the vicinity of Ottawa, but particularly on the wooded slope surrounding Parliament Hill, have been much disfigured by this insect. Upon the Experimental Farm, the attack was most severe

in the case of the varieties of *Betula alba*, but our native birches, *B. papyrifera* and *B. lutea*, have been hardly less injured.

The caterpillars were so numerous that five or six would be frequently found upon a single leaf, and the effect of their depredations was soon perceptible after they were first observed. They were particularly partial to the beautiful pendulous cultivated variety of the European birch, known as the Cut-leaved Weeping Birch, which is in the opinion of many the most beautiful ornamental tree grown.

The only remedial treatment tried was spraying the trees with a weak Paris Green mixture. This was found to be quite effective.

With regard to the life history of this genus, Mr. Chambers says as follows (Can. Ent., XIV, p. 154):—"The larvæ of several species of *Bucculatrix* are known in Europe; but in this country until now (1882), Dr. Clemens's 'mere mention' of the larva of *B. pomifoliella*, Clem., is all that has been published. Briefly, the larval habits of the genus may be thus summarized. The larva, while very young, mines in leaves, and leaving the mine, it feeds externally, moulting once in a little cocoonet, and again in a singular ribbed cocoon where it passes the pupa stage."

Further on in the same article, the detailed description of *B. ambrosiæfoliella* shows that the egg, a minute colourless globule, is deposited on the upper surface of the leaf, and the larva, after leaving it, mines inside the leaf, where, in three or four days, it passes the first moult. After this it leaves the mine and feeds externally until the time for the next moult, when it spins beside a rib a thin sheet of white silk; beneath this it spins a small circular cocoonet, in which the body of the caterpillar is doubled into a horse-shoe shape and the second moult is passed. Emerging from the cocoonet, the caterpillar feeds externally for a few days, when, either on or near the plant, it spins the ribbed cocoon in which it passes the pupa state.

In confinement, the cocoons are nearly always spun upon the leaves, but it is very rare to find them in that position in nature. The only cocoons which I have found upon the trees, were spun on the sides of twigs, where they bore a close resemblance in colour and shape to the winter buds. From the small number, however, three only, upon a tree where thousands of the larvæ had occurred, it seems unlikely that this is the usual position of the cocoons, and it may be that they drop to the ground and spin on low plants or other objects. In confinement, the moths emerged from cocoons kept all the winter in a warm office, in the beginning of January, but none were observed out of doors until July, nor was there any trace of a spring brood of caterpillars.

The cocoon is an object of great beauty and of no less interest when the caterpillar is observed building it. I was fortunate enough to detect a caterpillar in the act of beginning its cocoon, and was able to watch the process of construction. The insect lay extended on the leaf moving only the forepart of its body. A mat was first spun on the surface of the leaf, then the foundations of the ribs were begun of silk, which hardened almost instantly after exposure to the air. Little by little these were continued, and the meshes of an open net-work stretched between them, the caterpillar all the while retreating backwards as the structure advanced. The nut-like frame was gradually enlarged, until the middle was reached, and then tapered off toward the other end, up to four-fifths of the total length. So far the work has all been done from the outside. The little builder now crawls inside the frame work, and turning round, protrudes its head from the open end, begins again in the same way as it had first started the cocoon, and continues until the two portions touch. These are then joined together by silken threads spun from one to the other inside. The caterpillar is now completely enclosed in an open framework, and, as Mr. Chambers points out, if the larva ceased to spin at this stage, the cocoon would belong to the same class as those of *Plutella cruciferarum*, and a few others which pupate in an open net-work. But it immediately begins to spin the oval true cocoon inside this, and soon becomes invisible, and the cocoon darkens in colour.

In the article above referred to by Mr. Chambers, "Notes on the larva of *Bucculatrix ambrosiæfolia*" (Can. Ent. XIV, p. 153), an extremely interesting account of the insects of this genus is given and also a detailed description of the building of

the cocoons which he had watched under the microscope, together with a figure illustrating the way in which the longitudinal ribs are built up and strengthened little by little to support the transverse thread.

There are still some points of interest in connection with this little insect which require further study. I have found upon the leaves small mines which I presume were made by the caterpillars in their first stage, but I have not actually found the larvæ of *B. Canadensisella* in these mines, nor discovered the eggs. It is important to find out the usual location of the cocoons in which the insects pass the winter. *B. pomifoliella*, which is occasionally injurious to the foliage of apple trees, and was this year very abundant at St. Catharines, Ont., spins its elongated whitish cocoon on the twigs of apple trees.

In the autumn of 1889, I found large numbers of the cocoons of another species shaped somewhat like those of *B. Canadensisella*, but rather longer and pure white in colour. These were attached to dead grass leaves and the fruiting stems of a moss, under sugar maples. It seems possible that these may have fed upon the leaves of the trees and fallen to the ground when ready to spin. I hope next season to work out completely the life history of the Birch Bucculatrix. I append a description of *B. Canadensisella*.

Moth small, wings expanding $\frac{3}{8}$ of an inch. General colour, bright brown, the wings crossed with silvery white bars, three of these run from the outer edge about half way across the wings obliquely towards the apex, and there are two shorter subtriangular blotches on the inner margin of each fore wing. These latter, when the wings are closed, form two white dorsal saddles, the anterior of which is slightly the larger, and is followed closely by a tuft of raised black scales. At the extremities of the fore-wings are also several raised black scales a few of which are separated into an apical spot by an irregular narrow white band. The cilia of the fringes are pale brown. Head white; frontal tuft dark brown in the centre; antennae brown, slender, about $\frac{1}{8}$ inch long. Thorax brown with margins including the bases of the fore-wing, white. Leg and body pale fuscous silvery.

Fig. 14 showing the various stages of the Birch Bucculatrix has been kindly lent for use in this report by Prof. C. V. Riley, and was originally used to illustrate an article by Dr. A. S. Packard, the most complete yet written on the species, which appeared in *Insect Life*, vol. V. p. 16.

ON AN EGG PARASITE OF THE CURRANT SAW-FLY.

(*Trichogramma*, sp.)

Under the above title Professor Lintner published in his Second Report, 1885, an interesting account of a minute parasite which he had discovered in 1867 and again in 1882, attacking the eggs of the Imported Currant Saw-fly in the State of New York. This injurious saw-fly, the larva of which is usually known to Canadian fruit-growers as the "Currant Worm," is a pest which demands constant attention throughout the summer, and although the ordinary applications of Paris Green early in the season and White Hellebore later on when the fruit is formed, are perfectly efficacious, cheap and simple; yet, there is hardly a district where plantations may not be found stripped of every leaf during some part of the season. It is not well enough appreciated by fruit-growers that if the leaves be stripped from a bush either by fungous or insect enemies, even after the crop is gathered, they suffer much loss thereby; for without leaves the bush cannot store up nourishment to support the crop of the next year, and although there might be abundance of flowers, the fruit will drop without maturing from bushes which were stripped the year before. In view of the above, the discovery and distribution of a parasite which would keep in check such a redoubtable enemy, becomes an important matter.

I was therefore very much pleased on the 10th of last June to find upon the leaves of a gooseberry bush in the the garden of Mr. R. Montford, at Galetta, near Arnprior, Ont., eggs of the Imported Currant Saw-fly, which showed evident signs of containing parasites. Instead of presenting the usual translucent white appearance, they were shining jet-black and showed the shape of the pupa of the parasite within.

Some of the eggs contained two parasites in different stages of development when half the egg was black and the other half paler. Only a few eggs could be found on the occasion of my visit, but later, through the kindness of Miss Montford, I received a much larger supply of parasitised eggs, some of which were distributed to different gardens in the vicinity of Ottawa. I soon found, however, that the friendly parasite was already present in strong force and I collected parasitised eggs in all the gardens I had opportunities to visit. The specimens bred by Prof. Lintner were identified as *Trichogramma pretiosa*, a species originally described by Prof. Riley (Can. Ent. 1879, pp. 161–162) from specimens reared from the eggs of the cotton moth (*Aletia argillacea*, Hüb.). As the specimens bred at Ottawa this year did not seem quite to agree with the description, some of them have been submitted to Prof. Riley, together with several specimens bred from the eggs of another introduced saw-fly which has appeared in injurious numbers upon Russian Willows at Quebec and Ottawa. His report upon them is as follows:—

"So far as can be seen from the dry specimens of the two Trichogrammas from *Nematus ribesii* and *N. pallidiventris*, they are the same, but no satisfactory examination can be made of specimens in this condition. *Trichogramma*, like *Aphelinus*, and the other little yellow-coloured, thin-skinned Chalcidids, should be mounted when fresh in balsam. It is a most difficult thing, however, to distinguish between the species of the genus." I exhibited some of these specimens at the Rochester meeting of the Association of Economic Entomologists, and Mr. L. O. Howard then told me that the genus was a most discouraging one, that he had examined carefully under high powers of the microscope some hundreds of specimens, but could find no good characters by which to separate the species; the apparent characters, viz., in the arrangement of the little hairs on the wing and the number of cells in the uncus of the stigmal club are worth nothing, and vary in individuals reared from the same batch of eggs. He agreed with Prof. Riley that the only thing to do was to wait until abundant material had been collected, when probably characters for separation of the species would be found, but it would only be by careful study and a survey of the entire field.

SOME OTHER USEFUL PARASITES.

In addition to the above record, some other equally interesting parasites came under my notice during the past season, a few of which I will mention to show the good offices performed by others as well as these minute and almost invisible insects.

The different species of *Trichogramma* are minute, four-winged, yellow insects, varying from about one hundredth to one twenty-fifth of an inch in length, with front wings broadly expanded towards the apex and ornamented with lines of hairs radiating from the base. The hind wings are narrow and more deeply fringed than the other pair. They are parasites on the eggs of many kinds of insects, frequently more than one specimen emerging from a single egg.

Parasite of an Imported Willow Saw-fly (*Nematus pallidiventris*, Fallen).—In 1891 the Rev. T. W. Fyles, of South Quebec, recorded (Can. Ent., XXIII, p. 135) the first occurrence of this saw-fly in America. He had reared it from specimens found upon a lately imported Russian willow growing in his garden. In September last this same species was found abundantly ovipositing upon the leaves of terminal shoots of *Salix laurifolia* in the botanic garden at the Central Experimental Farm. The eggs are inserted beneath the epidermis of the lower side of the leaves in open clusters of from about half a dozen to one hundred. Each egg is separate, and causes a comma-shaped swelling. The eggs hatch in about ten days, and the voracious larvæ soon strip the shoots, entirely consuming the leaves as they work down from the top. They rest when half grown on the edges of the leaves, the curved bodies standing out like a heavy fringe. They are dark green dotted with black, somewhat like the larvæ of the Imported Currant Saw-fly, to the perfect insect of which this also, although brighter-coloured, bears a considerable resemblance. Great numbers of the egg-clusters, upon examination, showed the dark colour indicative

of the presence of parasites within the eggs. Leaves enclosed in jars, gave, a month later, specimens of the *Trichogramma* very similar to the species bred from the Imported Currant Saw-fly.

PARASITE OF THE TIGER SWALLOW-TAIL (*Papilio Turnus*, L.)—The following instance will illustrate the very small size of the parasites of the genus *Trichogramma*, and the good work they are capable of performing will be shown below under "Parasites of the Zebra Caterpillar." On July 11, I found a single egg of *Papilio Turnus* upon a low bush of *Amelanchier Canadensis*, T. and G. at Nepigon. This egg was shining black in colour, so was carefully enclosed in a small glass bottle to secure the parasites. In due time they began to emerge, and at length no less than forty-one specimens came out from the one egg, which only measured 1 mm. in height by 1·10 mm. in breadth. The species has been identified by Prof. Riley as *T. intermedium, How.*, a species closely resembling T. *minutum*, Riley, which was originally described from the eggs of *Limenitis Disippus*, a common butterfly.

Fig. 15. *Trichogramma minutum*, Riley.

In Mr. Scudder's "Butterflies of the Eastern United States and Canada," is recorded an instance where seventy-nine specimens of *Trichogramma minutissimum* were bred from five eggs of this same butterfly, making an average of sixteen to each egg. Prof. Lintner states that six specimens of *T. minutum* have been reared from a single egg of *L. Disippus.*

PARASITE OF THE VANCOUVER ISLAND OAK-LOOPER (*Ellopia somniaria*, Hulst.)—The oak trees in the vicinity of Victoria, B.C., have been for many years periodically stripped of their foliage, for a few years in succession, by myriads of the larvæ of the above named insect; then for a few years the trees are exempt from injury. This has been noticed by many of the citizens of Victoria and there has been much speculation as to the cause of the sudden disappearance of the marauding hosts. From material kindly sent to me, and with the valuable assistance of Mr. W. H. Danby, of Victoria, I have been able to discover several of the causes which periodically check the undue multiplication of this pest. The most effective of these is a fungous disease which has been identified by Prof. Roland Thaxter, as *Sporotrichum globuliferum*, Spegazzini as recorded in my last report. This attacks the insect in all stages of development.

From the chrysalides, Mr. Danby and I have bred numerous specimens of a yellowish Ichneumon fly (*I. cestus*, Cress.) which is easily recognized. The length is about three-eighths of an inch, and the whole body is yellowish orange with one black band across the abdomen. Besides this, a new species of *Pimpla* was bred from pupæ sent to me by Mr. Danby. This has since been named by Mr. W. H. Harrington, *Pimpla ellopiæ*, Har. (Can. Ent. XXIV. p. 99).

The above-named parasites reduced the numbers of the caterpillars last year enormously, but there was yet another enemy awaiting them. *E. somniaria* passes the winter in the egg state, tucked beneath mosses or flakes of bark. Very few eggs were to be found on the bark last winter and nearly every specimen of such as were discovered in two large consignments of bark sent by Mr. Danby, were found to be parasitised by a minute black Proctotrypid which Prof. Riley informs me is an undescribed species of *Telonomus.* Only one egg produced a caterpillar which was bred to maturity in my office upon a growing oak seedling.

PARASITES OF THE ZEBRA CATERPILLAR (*Mamestra picta*, Harris).—I know of no plant or shrub which this bright coloured caterpillar will not attack and it is frequently a source of considerable injury. It was sent in from several localities during the summer as a pest upon cabbages and potatoes. During September I found upon a plot of Bokhara Clover (*Melilotus alba*, Lam.) hundreds of clusters of the eggs of *Mamestra picta*, many of which showed from the colour that they were parasitised. The eggs were laid in a neat close patch, entirely covering the under-

side of a leaflet right up to the edges. When parasitised they were of a dark leaden hue. Several of these egg-patches were enclosed in glass jars and in a few days thousands of specimens of a species of *Trichogramma* and about an equal number of a tiny black parasite, were found in the jars, the former of these was named by Prof. Riley *T. pretiosa* and the latter *Telonomus* (new species). Of the large number of egg-patches of *M. picta* which were collected, not one per cent gave the caterpillars of the moth, owing to the attacks of these parasites.

PARASITE OF THE LESSER GRAPE-VINE SPHINX (*Ampelophaga myron*, Cram.) AND TOMATO SPHINX (*Protoparce celeus*, Hüb.).—During the past summer, both of the above caterpillars were unusually abundant in western Ontario; very few however, apparently came to full growth, on account of the attacks of the small Braconid, *Apanteles congregatus*, Say. The eggs of this insect are laid by the female fly within the body of a caterpillar by means of a needle-like ovipositor, with which she pierces the skin. Sometimes as many as 200 eggs are laid in a single caterpillar (207 cocoons of this parasite were actually counted on a large specimen of the Tomato Sphinx found in London, Ont.) The young maggots upon hatching feed on the fatty parts of their victim and, when full-grown, force their way through its skin, and work themselves out as far as the last joint of their bodies, when they begin spinning their small white cocoons, which stand on end and present the appearance of fig. 16. From these eventually the small active black four-winged flies emerge. Besides several parasitised specimens of the Lesser Grape-vine Sphinx, which I received from correspondents, there were also some caterpillars of the Tomato Sphinx sent in for report. Mr. W. W. Hilborn, of Leamington, Essex Co., Ont., says: "I am glad to learn what you write with regard to the parasite of the Tomato worm. Never until this season, has the caterpillar of the Sphinx moth done much injury. This year both tomatoes and potatoes have suffered. In some places whole fields have been destroyed. I have about three-quarters of an acre of early tomatoes that have been injured very much, although we hand picked the caterpillars every day for some time. A week or two ago we found a few which were parasitised like the one I sent you. We did not disturb any of the caterpillars which were thus affected and now there are hundreds of them, In fact, there are now (21st August) very few that are not parasitised. I sincerely trust that this parasite will continue its good work." I found on enquiry that practically the same state of affairs as is described by Mr. Hilborn, existed over a large district in western Ontario. I give herewith a figure from which the appearance of a sphinx caterpillar bearing the cocoons of the beneficial parasite is plainly shown. It will be well if all who see such will endeavour to restrain what appears to be an instinct in man, to destroy everything belonging to the animal world, which they do not understand or which they are not afraid of.

Fig. 16—Cocoons of *A. congregatus* on Sphinx caterpillar.

DIVISION OF BOTANY.

POTATO-BLIGHT AND POTATO-ROT.

The disease known as Potato-rot (*Phytophthora infestans*, de By.) is now well established in all the potato growing countries of the world and causes more loss to the potato crop than all the other sources of injury combined. In rainy seasons it is considered inevitable by most farmers, as a result of the wet conditions alone. This, however, is not the case, and it is important to have it well understood, as soon and as widely as possible, that this disease is due to the attack of an easily recognized vegetable organism belonging to the class of fungous parasitic plants, and further that careful experimentation has proved the possibility of preventing a large proportion of the loss by a systematic treatment with certain chemical mixtures as described below.

Many letters of inquiry having been received from farmers in all the eastern provinces of Canada, I considered it advisable to write the following letter, copies

of which were sent to several of the leading newspapers for publication early in July.

There are some facts which should be kept constantly in mind. 1. The Potato-blight of the leaves and the Potato-rot of the tubers are both due to the same cause. 2. This cause is a fungus which can be controlled. 3. The dry-rot seen in potatoes when they are planted in the spring as seed, produces both the blight on the leaves in August and the wet-rot of the tubers in autumn. 4. No potatoes containing patches of dry-rot should be planted as seed.

Remedy for Potato-rot.

"Ottawa, July 7th, 1892."

"To the Editor of———.

"Sir,—There are few diseases of field crops which are the direct cause of more loss to the farmers of Canada than that which is known under the different names of 'Potato-rot,' 'Potato-blight' or 'Potato-rust.' My object in writing this letter is to draw the attention of your readers to the fact that a practical and simple remedy has been discovered, and that the best time for applying it is during the latter half of this month.

"This disease of the potato is due to the attacks of a parasitic fungus, known by the name of *Phytophthora infestans.* The life history of this fungus is briefly as follows: The fungus passes the winter inside the potato tuber and is planted with it in the spring. As soon as the potato throws out its shoots, the parasite grows with it, running up through the tissues of the stems, and from about the end of July produces beneath the leaves an abundance of spores, or seed-like bodies. These are exceedingly minute, but are produced in such numbers that they frequently give a frost-like appearance to the under sides of the leaves. When these spores are produced on the leaves the appearance known as 'rust' shows itself in the shape of dark brown spots, which are caused by the drying up of the tissues, from the parasite having used up their contents. From the rust stage all future infection takes place. Some of the spores are carried by the wind and falling upon the leaves of other adjacent plants, produce more rust spots, while others falling to the ground are washed beneath the surface, and reaching the forming tubers produce the rot stage. The wet-rot, as seen in autumn in the tubers, is the form of this disease which is best known, but Potato-rot is really a dry rot which kills the tubers, and in autumn the wet-rot follows as a result of decay. In winter the disease occurs in the tubers, as patches of hard, whitish, diseased tissue.

"In this district the rust stage does not generally appear until about the first of August and this is the first evidence that blight is present in the field. As a rule the dark spots appear only on a few leaves at first, but if the weather be favourable the disease spreads rapidly from spores carried by the wind from these centres of infection, so that a large field may become diseased in a few days, and as a result the crop of potatoes ruined.

REMEDY.

"Careful experiments have shown that by spraying the potato haulms at the time the rust first appears, with the mixture of sulphate of copper and lime, known as the 'Bordeaux mixture,' the rust or blight on the leaves can be stopped, and as a consequence a large proportion of the rot in the tubers can be prevented.

BORDEAUX MIXTURE.

Copper sulphate	6 pounds.
Lime, fresh	4 pounds.
Water	45 gallons.

"To make Bordeaux mixture—Take six pounds of copper sulphate (blue vitriol) powdered, and dissolve it in one gallon of hot water in a wooden tub (iron must not be used, as the vitriol would attack it.) Slake four pounds of lime in sufficient water

to make a thin whitewash. Strain this through a fine sieve or a sack to remove all lumps. When both liquids are cool, pour the lime-wash into the copper sulphate solution, stirring it all the time. Now add enough water to make forty-five gallons, and the mixture is ready for use. It is best to prepare the mixture some time before required, but it must be kept covered to keep out all dust and rubbish.

"To apply this mixture to the foliage, undoubtedly the best and cheapest way is to use a proper spraying pump and nozzle, but if these are not on hand, good results which will well repay the trouble, may be obtained by applying the mixture with watering cans supplied with fine roses. There are several different kinds of spraying pumps in the market. Perhaps the most convenient for this work is a force pump attached to a barrel on wheels, to be drawn through the field by a horse. Smaller machines, known as Knapsack Sprayers, consist of a reservoir containing a small force pump, which can be carried upon a man's back. Both of these kinds of pumps can be purchased for about $10 to $20. It will be necessary to spray the fields two or three times to protect the crop thoroughly. There is no danger of injuring the foliage with the above mixture, as it is only half the strength of the original formula which is generally used.

"A great advantage of this mixture is that Paris Green, the only practical remedy for the Colorado Potato-beetle, can be applied at the same time. To do this, mix from a quarter to half a pound of Paris Green with a little water so as to make a thick paste, and then add it to the 45 gallons of Bordeaux mixture; that is, it is used in exactly the same strength as with plain water.

"These mixtures must be kept constantly stirred while being used, as both the lime in the Bordeaux mixture and the Paris Green sink quickly to the bottom of any mixture if left undisturbed."

The above recommendation was carried out here on the Central Experimental Farm amongst other experiments, Paris Green being added in the proportion of 1 lb. to 90 gallons of the Bordeaux mixture, and on the whole it produced as good results as any of the several mixtures tested. The insects which gave most trouble at Ottawa this season were, the Colorado Potato-beetle (*Doryphora* 10-*lineata*, Say). The Cucumber Flea-beetle (*Epitrix cucumeris*, Harris.) which eats small holes in the surface of the leaves, and Professor Jones, of Vermont, thinks it thus makes a starting point for the fungus *Macrosporium solani*, to injure the tissues. Later in the season the Large Red-headed Flea-beetle (*Systena frontalis*, Fab.) caused injuries similar to those of the last named enemy. All of these were kept in check by the Paris Green and Bordeaux mixture combined.

Having had considerable correspondence with Prof. L. R. Jones, Botanist to the State Agricultural Experiment Station at Burlington, Vermont, about the best means of controlling this disease, a series of joint experiments was planned, to be carried out contemporaneously at Burlington and Ottawa, with the same mixtures and as far as possible, with the same varieties of potatoes. The results of these experiments will be very useful for comparison with later work; but owing to unforeseen circumstances it is unadvisable to give now the full details of this year's experiments at Ottawa. These circumstances were, in the first place a very great inequality in the character of the soil in different parts of the field where the plots were measured off for trial; a severe and prolonged drought set in during the month of July and lasted till the 28th of that month, so that many of the varieties in poorer parts of the field were injured beyond recovery. This drought was more severe on account of following a very wet June. Again the Potato-rot was far less prevalent last season in this immediate district than usual, so that although there was practically no rot among the sprayed potatoes, neither was there any worth mentioning among those which were not treated.

I may however state that the general results were most encouraging, and the effect of the different treatments was conspicuously apparent upon the block of sprayed potatoes, which occupied the middle of the field, as compared with those which surrounded them, and which had been left unsprayed. Untreated vines had lost every vestige of foliage by the beginning of September, while some of the sprayed varieties remained perfectly green up to the time the crop was dug, on October 8th.

The defoliation this year of unsprayed vines was probably due more to the attacks of another disease caused by the fungus *Macrosporium solani*, and of insects, than by the true Potato-blight. Upon sprayed vines, however, these were not nearly so injurious, and although after all the unsprayed vines had been defoliated the insects congregated in myriads upon the still green leaves of the sprayed plots, and many of the plants were little by little eaten away, enormous numbers of the insects were found dead which had paid for their meal with their lives. The importance of the foliage being preserved as long as possible, was shown by the far larger crop of those varieties which held their leaves longest, and this not so much in the number of tubers as in their size. Two varieties which were remarkable for their power of resisting all enemies were "Holborn Abundance," and the "State of Maine." The following varieties were also noticeable, McIntyre, Empire State, St. Patrick, Clark's No. 1, Burpee's Surprise, White Star, Mammoth Prolific.

LAWN GRASSES AND FODDER PLANTS.

The experiments in testing the value of various foreign and native fodder plants, have been carried on in accordance with the plan already treated of at some length in previous reports. During the past season about one hundred and fifty different species and varieties were cultivated at Ottawa, and notes taken of their yield per acre, nutritive value, hardiness and suitability for agricultural purposes. One hundred and sixty-one collections containing seeds of thirteen of the most promising varieties of grasses, in all 2,173 samples, were distributed to be tested in the different provinces of the Dominion. In addition to the above, twelve larger samples of the valuable Austrian Brome grass were sent out for testing on a larger scale. The grass plots proved an attractive feature of the farm work to the large number of farmers and botanists who visited the Central Farm. An interesting addition was made to the collection of fodder plants, in the shape of all the different varieties of clovers of which seeds were advertised for sale by seedsmen in this country and in Europe. These were all sown last spring and made a good growth for the first year; but it remains to be seen how they will pass the winter.

Attention was also given to the important question of Lawn Grasses, with regard to which perhaps more enquiries are received than any other subject connected with grasses. An interesting bed was laid out in the shape of "a grass mosaic," sown in the pattern of the "Union Jack." The plan was suggested to me by Mr. J. B. Olcott, of South Manchester, Conn. A plot two rods long by half a rod wide, was sused for the purpose. First of all a wide St. George's cross (one foot wide) was cown in the centre with Hard Fescue (*Festuca duriuscula*); lying over this, the two entres meeting, was a St. Andrew's Cross of half the width (six inches), sown withi Sheep's Fescue (*Festuca ovina*), and the eight angular spaces lying between the l mbs of the two crosses were sown with different grasses. These were chosen so asto give the greatest variety of colour. In the very centre where the crosses met a small patch of another grass was planted. The object of this experiment was to show the unadvisability of sowing lawns with mixtures containing a large number of different varieties of grasses. What is required in a lawn is a sward of uniform colour and even texture. This cannot be secured if many varieties are sown together. When examined, grasses will be found to vary very much indeed, both in colour and the nature of their leaves, as to width, fineness and rigidity. This fact was well illustrated by the plan adopted, which attracted the favourable notice of many visitors. The satisfactory conclusion was arrived at that for good lawns in Canada, no grass could compare with the common June grass of our roadsides (*Poa pratensis*, L.), also called "Kentucky Blue-grass," or Spear grass, and in Europe, Smooth Meadow-grass. For a permanent bright colour, evenness of growth and softness of texture, as well as its iron-clad hardiness and power to withstand abuses, this grass has no equal. It was, too, almost invariably proclaimed the best in appearance, by all who were asked for an opinion, whether they knew the different grasses or not. The seed is easily procured, is cheap and is nearly always clean,

as it ripens its seeds before most of the weeds which grow among grasses. Enough seed for a good large lawn can be gathered in an hour by the roadside at the end of June by anyone who will take the trouble to do so. After a week this will be dry enough to rub out all the seed, which may be sown at once. For a successful lawn, the soil should be of good depth and well drained. The surface should be ploughed, levelled, and rolled smooth in autumn. In the spring it should be again rolled, the seed sown and then lightly rolled or raked in. The seeding should be thick, in the proportion of as much as 3 to $3\frac{1}{2}$ bushels of June grass to the acre, to which $\frac{1}{4}$ lb., of White Clover may be added. If the soil be moist, about half the above quantity may be made up of one of the many fine-leaved forms of *Agrostis* or Bent grasses, such as *A. stolonifera;* but the colour of this latter is of a decidedly different shade of green, and it must be done with the idea that the Bent grass, if more suitable to the soil, is ultimately to supplant the June grass. In the mosaic mentioned above the following grasses were used.

1. Hard Fescue (*Festuca duriuscula*), dark blue-green (hair-like leaves).
2. Sheep's Fescue (*Festuca ovina*), yellowish green (hair-like leaves).
3. Wood Meadow grass (*Poa nemoralis*), intense vivid green.
4. June grass, Kentucky Blue-grass (*Poa pratensis*), bright green.
5. Red Top (*Agrostis vulgaris*), pale green.
6. Squirrel tail (*Hordeum pratense*), pale glaucous green.
7. *Eatonia Pennsylvanica*, bright yellow-green.
8. Wire grass, Canada Blue-grass (*Poa compressa*), dark purplish green.
9. Water Bent grass (*Agrostis stolonifera*), pale yellowish green.
10. Meadow Foxtail (*Alopecurus pratensis*), darker green than No. 5.
11. *Agrostis scabra*, glaucous variety, pale green (hair-like leaves).

The recognition of the colours and varying textures of grasses suggests many ornamental uses for these plants, such as the permanent marking out of tennis courts or other ornamental patterns on lawns.

Chess (*Bromus secalinus*, L).

In my annual report for 1891, I stated that at the request of one of my correspondents I had planted 100 grains each of Chess seed and Fall wheat, with the purpose of proving that, in the first place, Chess would come true from seed and produce seed from which Chess and nothing else could be grown; and secondly, that no adverse treatment could produce a plant of Chess from a grain of Fall wheat. As stated, 100 grains each of Chess and Fall wheat were sown in September, and each grain was marked with a small picket. I had a witness present with me during the whole sowing operation, according to agreement. In addition to the 100 grains, a single row 8 feet long and 2 inches wide was also sown of each kind of seed.

Chess.—The Chess seed all germinated and appeared above the ground in the autumn of 1891. In the spring of 1892 it grew rapidly, as soon as the snow water, which lay on it for a fortnight, soaked away. The flowering panicles appeared May 27, and the seed was ripe by the end of July. The single row was cut down twice and continued throwing up flowering spikes until September.

Fall Wheat.—Most of the seed germinated and appeared above the ground in the autumn of 1891.

During the winter of 1891–92 the snow was shovelled off half the bed three times, so as to expose the young plants to the weather. In the spring, water lay on half this plot for a fortnight after the snow melted. In April half the single row was stamped down into the muddy ground with the heel of my boot and the other half was cut off close to the ground with shears. After this the plot was left alone.

RESULTS.

Chess.—Nearly every grain grew and produced a strong plant of Chess with many stems which bore an abundance of seed.

Fall Wheat.—Many plants of the 100 were drowned out by the water lying on them in spring; 42, however, grew and all produced Fall wheat. Of the single row,

both the plants which were stamped into the muddy soil and those which were cut down, grew equally well with the others and all produced Fall wheat.

To the above record I will add that of a single row of Chess sown in the spring of 1892, only one plant produced flowers that year. The plants went into the winter in healthy condition and will doubtless flower next spring.

In view of the above, I repeat again what I said last year; "There is only one remedy for Chess—to sow clean seed-wheat in clean land." If this be done there will be no trouble with Chess. Some thousands of farmers had this experiment brought under their notice during the season, and I trust that some of them may have been convinced that Chess cannot be grown from the seed of Fall wheat, whatever adverse circumstances it may pass through, any more than a rose can be grown from an onion seed. An illustration of the absurdity of the contention frequently put forth at Farmers' Institute Meetings, that Chess is a bastard grain and, therefore, cannot produce seed, is the fact that it is now largely grown in Oregon and Washington States as a hay grass. It is claimed to have a special value from growing on land impregnated with alkali and unfit for the cultivation of Timothy. Mr. W. Tasker, of Ladner's Landing, B.C. writes. "I received some rye grass seed from Canada four years ago and found the following summer that it was nearly all Chess. I cut it for hay and the horses ate it well. Later, I was at Salem, Oregon, at the State Fair and saw the same grass among others labelled "Brome Grass." In speaking to the Manager of the Experimental Farm he told me that it made fair hay and if sown in the fall on land which turns white, a good crop of hay could be cut the following summer. It occurred to me that this meant alkali land. I afterwards learnt that it was a good deal cut and when Timothy was worth $10 per ton, it was worth $8. It is from three weeks to a month earlier than Timothy. When I came home from Oregon I gathered enough seed to sow half an acre. It yielded well and I harvested enough to sow nine acres of fallow with Chess and Red Top, and twenty acres of Chess and Timothy sown only on the surface, the other was harrowed in. The hay has the appearance of being good. I would not recommend sowing Chess where Timothy will do well, but in the North-west where there is Alkali in the soil it might be well to try it. Chess can be sown in the fall, a crop of hay reaped the following June, and the land then fallowed. I sow at the rate of 50 or 60 lbs., to the acre. Some complain of having Chess in their Timothy, I told one man he could get rid of it by cutting before the Chess had seeded when it will be done with, as it is only an annual; but if it is cut very early it will grow again from the roots, like oats cut for hay. Feeding off with sheep will finish it. When grown with Timothy, if left until the latter is ready, the Chess seed has fallen to the ground. Chess is hardier than Fall wheat. I had some last winter which was covered 8 inches deep with salt water for 3 days, and yet it came through all right. I never heard of Chess growing from Fall wheat or of killing pigs by the moon until I came to America."

The following letter containing much valuable information on this subject, has been received from Professor Moses Craig, Botanist of the Oregon State Agricultural College, in reply to an enquiry:—

"CORVALLIS, Oregon, 15th November, 1892.

"In reply to your letter of enquiry regarding the use of Cheat as a forage plant, I would say that in this (Benton) county, Chess (meaning mainly *Bromus secalinus*, *L.*, though *B. racemosus* and *B. sterilis* are occasionally mixed with the above), grows well, and is considered by most farmers to be as good as Timothy, selling readily for the same price—$12 a ton. This applies mainly to the hill regions, as in the valleys other grasses can be profitably grown.

"It endures the dry dusty summers much better than Timothy (*Phleum pratense*, L.), and is often sown in 'slashes' or freshly cleared and burned over land, where it makes a good stand. In the ranches of the Cascades when mixed with Wild Oats (*Avena fatua*, L.), it forms the entire food of cattle.

"Perhaps I can best answer your questions by giving the views of my correspondents:—

E. P. Williams, Lane County, says:—I sow Cheat for fodder, and find it excellent for all kinds of stock.

J. Bagley, Polk County, says:—Very good hay for cattle and sheep.

S. P. Reeder, Washington County, says:—Cheat grass makes good hay for horses or cattle.

C. D. Steen, Linn County, says:—Wild Oats and Cheat make good hay if cut green.

E. F. Messner, Josephine County, says:—Chess makes good hay for horses, sheep and cattle.

Wm. Miller, Lane County, says:—I feed Cheat to horses and cattle, and consider it a fair quality of hay.

J. D. Hayes, Josephine County, says:—Chess makes fair hay for cattle.

J. G. McCune, Linn County, says:—I consider Chess of great value as hay for horses and cattle.

Ernest Eggerth, Umatilla County, says:—Have used it to feed stock and horses. Cheat hay made when in bloom makes good hay, but not equal to Timothy.

G. R. Stephenson, Multnomah County, says:—I consider it of no value.

S. W. Miles, Polk County, says:—Wild Cheat not of as much value as the tame hay.

L. P. Williams, Clackamas County, says:—Wild Oats and Chess may have some value as feed if cut early enough, but as they open before Clover and Timothy, their value is limited."

"I think that Chess grows *much better* on 'white land' or soil impregnated with alkali than does timothy and other tame grasses. In regard to the time of sowing Cheat for pasture, some sow in the fall, giving a spring pasture, others sow in the spring for late summer pasturage. For hay the seed is usually sown in October.

Opinions differ regarding the value of Cheat, but in the mountains, foot-hills, and on white land, large quantities are annually saved for hay, and for these localities there is nothing to take its place except Wild Oats.

In the valleys no one raises it, as other grasses will give better returns there."

I have reproduced the above letter in full, as it contains much that may be of use to British Columbian and North-western farmers.

REPORT OF THE POULTRY MANAGER.

(A. G. Gilbert.)

To William Saunders, Esq.,
Director Dominion Experimental Farms,
Ottawa.

Sir,—I have the honour to submit to you the fifth annual report of the Poultry Department for the year ending 15th January, 1893. In my last report, which extended to 29th February, attention was given to the effect of a morning warm ration on a certain number of fowls. The ration was composed of:—

	Lbs.	Oz.
Bran	2	8
Shorts	2	8
Ground meat	1	8

with clover hay and a small quantity of coarse sand and fine ground oyster shells mixed, with the object of preventing eggs being laid with soft shells, or no shells at all.

It had been noticed in previous years that the laying stock were most addicted to the vicious habits named during the month of March. Consequently, careful attention was paid to the layers during that period, and it was found that the vices were not indulged in to the same extent as formerly. This may have been owing to the mixing of the oyster shells and coarse sand in the soft feed, but no definite conclusions could be arrived at from one observation. The same ground is being gone over this season with certain additions to the rations of last winter, which are noted elsewhere.

SOME OBSERVATIONS AND THEIR RESULTS.

It was observed, however, that the fowls in the pens containing the lesser number were freer from vice than the more crowded ones, thus showing the benefit of room and comparative range. The importance of farmers giving their laying stock as much room as possible was impressed upon them in my last report in the following words:—"The layers do better when they can enjoy as much freedom as possible. Many farmers have their poultry houses so arranged that with very little trouble or expense they can allow their fowls access to a barn, stable or enclosed shed, where gravel, sand, coal ashes or other substances may be found for the hens to scratch in. Fowls so situated are not likely to give way to egg or feather eating, or laying eggs with soft shells or no shells at all." The experience of the past season confirms this. The observations of the past few years also lead to the conclusion that in constructing winter habitations for fowls it would be a good plan to have half of the floor of the pen covered with straw litter and the other half with coarse sand and gravel, or half wooden flooring and the other half dry earth. Placing the earth on the board floor would be more likely to keep it dry, which is absolutely necessary. Experience with earth, on board floors, has shown that it would not be necessary to remove the earth for three or four months, provided it was occasionally raked over and a small quantity added at the same time.

A TEST OF DIFFERENT BREEDS.

A good opportunity was afforded of trying different breeds in enforced confinement when the breeding house was completed at the end of February last, but the construction of the outside runs was unavoidably postponed for some months later. The house

contained 12 pens 8 x 5 feet each, and they were calculated to hold five or six females and one male. The following were placed in the building:—

Pen 1.—White Leghorns: 7 pullets, 1 cockerel.
" 2.—Black Minorcas: 5 hens, 1 cockerel.
" 3.—Andalusians: 5 pullets, 1 cockerel.
" 4.—Plymouth Rocks: 7 pullets, 1 cockerel.
" 5.—Wyandottes: 5 pullets, 1 cockerel.
" 6.—Houdans: 5 hens, 1 cockerel.
" 7.—Black Hamburgs: 6 hens, 1 cockerel.
" 8.—Langshans: 4 hens, 1 cockerel.
" 9.—Buff Cochins: 5 hens, 1 cockerel.
" 10.—Red Caps: 3 pullets, 2 hens, 1 cockerel.
" 11.—Coloured Dorkings: 4 pullets, 1 hen, 1 cockerel.
" 12.—Golden Polands: 3 hens, 1 cockerel.

The results desired to be gained by observation of the breeds named in close confinement were:—

1. The breed to first develop vice.
2. What that vice might be.
3. What breeds stood the close confinement best.
4. To find a remedy, if possible, for any vice developed.

When the fowls were placed in the house the floor of the pens was covered with straw litter, but some of the heavier breeds became so palpably out of condition that a change of some kind became necessary. The straw litter was removed and coarse sand and fine gravel substituted. This had a beneficial effect, as the condition of the stock quickly improved. Vegetables, grit, &c., &c., had been supplied to the different pens.

RESULTS OBSERVED.

The first to develop any vice were the Black Minorcas, which after laying well for two months began feather eating.

They were followed soon after by the Andalusians which displayed the same vice. This breed did not lay, meanwhile, as many eggs as the former.

The Black Hamburgs, Wyandottes and Red Caps followed and it became evident that change of treatment was at once necessary, or all would go the same way. The Red Caps, Dorkings, Buff Cochins and Houdans were removed to a larger pen, with outside run, and the Black Minorcas were allowed out to run at large, but, as it was the breeding season only one pen of fowls could be allowed out at a time. The worst cases were let out oftener than the others. As soon as the fowls got out they ceased the vicious habit. It was noticed that while the Minorcas picked feathers vigorously they did not eat eggs, but this may have been owing to a nest box of improved pattern and which kept the eggs more secluded than those formerly in use. Or, it may have been owing to the gravel and grit always on the floor.

THE REMEDY.

The only effective remedy found was to let the fowls outside. It was plainly evident that the long winter confinement in the one house protracted in the more limited space of the second was the cause of the feather picking. This experience goes to show that while meat, grit, vegetables, &c., are absolutely necessary at all times, and are no doubt deterrents up to a certain date, that close confinement will eventually end disastrously,—another strong argument in favour of as much freedom as possible, under all circumstances, to both laying and breeding stock. It may be noticed that no bone food of any sort was used, although ground meat was given at stated intervals. Some time ago a mill for cutting green bones was procured and the bones so cut (not ground) are being fed at regular intervals. It will be interesting to note the effect, as much has been claimed for a "green bone ration," one of the claims being the prevention of feather and egg eating.

SOME OBSERVATIONS.

Briefly stated, the observations noted were :—

1. Six Black Minorca hens after laying well for some months were the first of 15 breeds to develop feather picking.

2. The replacing of the straw litter on the floor of the pens by earth, had a good effect.

3. The earth on the board floor, occasionally raked over and renewed kept remarkably clean for 5 months.

4. The most of the droppings were deposited during the night on the platforms under the roosts. These platforms were cleaned every morning and folded up against the partitions, so allowing more scratching room.

5. Keeping the pens scrupulously clean seemed to teach the fowls cleanly habits.

6. The earth when removed was a valuable manure.

7. That close confinement may be borne for a longer or shorter period, according as the essentials are supplied, but eventually ends disastrously.

8. The only remedy found was allowing the fowls outside range.

9. When it is impossible to allow the fowls, in winter, to shed, barn or other scratching ground, put fewer in a pen.

A CONTRAST.

In the pen next to the Black Minorcas were six White Leghorn pullets (yearling hens in May). Under the same conditions they laid well, six eggs per *diem* being occasionally gathered from them. They developed no vice and kept in excellent condition although evidently anxious to get out. This result was as surprising as it was unexpected for belonging to the nervous, high flying, Spanish class, it was not anticipated that they would stand the strain as well as the heavier Asiatic breeds. Perhaps this one case should not be taken as a criterion.

Breeding Pens made up.

The different breeding pens were made up as follows :—

Breeds.	Number in Pen.	When Mated.
Langshan	4 hens, 1 cockerel	March 5.
Andalusian	5 pullets, 1 cock	do 8.
Golden Poland	3 hens, 1 do	do 9.
Plymouth Rock	7 pullets, 1 cockerel	do 17.
Brahma	7 hens, 1 do	do 17.
White Leghorns	7 pullets, 1 do	do 25.
	Crosses.	
4 Plymouth Rock hens, 3 Brahma hens	White Leghorn, cock	April 8.

Other breeding pens were made up as stated in another page describing the behaviour of certain breeds in close confinement. The Buff Cochins are omitted from the list, as the pen was broken up, owing to the death of two hens and the cock. The Plymouth Rock cockerel also died but another fine bird was purchased and placed in the pen. Such was the demand for eggs during the hatching season that extra pens had to be made up of White Leghorns and Plymouth Rocks ; and still all the orders could not be supplied. The following birds were purchased in order to infuse new blood :—1 Brahma, cockerel ; 1 Langshan, cockerel ; 1 White Leghorn, cock ; 1 Plymouth Rock, cock. The new breeds added to the stock were Red Caps, Coloured Dorkings and Golden Polands.

Eggs set and Chickens Hatched.

When Eggs were Set..	Description of Eggs.	No. of Chicks hatched.	When Hatched.	Remarks.
March 25...	11 Red Cap...................	7	April 15...	
do 28...	7 do 7 Coloured Dorking........	5	do 18...	
April 19...	12 Plymouth Rock....................	10	May 10...	
do 23..	13 Andalusian........................	12	do 12...	From Toronto.
do 30...	13 Crosses White Leghorn and Brahma.	5	do 20...	
do 30...	13 Buff Cochin	4	do 20...	Imported.
May 12...	9 Crosses, 4 White Leghorn..... ..	9	June 2...	
do 16...	13 Black Minorca....................	11	do 6...	From Guelph
do 16...	do	8	do 6...	do
do 22...	do	7	do 11...	
do 23...	13 Plymouth Rock.....................	9	do 13...	
do 24...	13 White Leghorn....................	5	do 14...	
do 27...	13 Crosses White Leghorn and Brahma..	8	do 17...	
do 27...	6 Brahma, 7 Langshan	7	do 17...	
do 31...	6 White Leghorn, 7 Langshan	13	do 21...	
June 4...	13 Langshan	9	do 25...	
do 9...	7 White Leghorn, 6 Wyandotte........	8	do 30...	
do 13...	6 White Leghorn, 5 G. Polands, 2 Wy.	10	July 4...	
do 14...	7 Black Minorcas, 6 Brahma	8	do 5...	
do 18...	7 Wyandottes, 6 Plymouth Rock......	2	do 9...	
do 18...	5 B. Minorcas, 5 Brahma, 3 G. Poland.	11	do 9...	
do 22...	7 Wyandottes, 6 Brahma..............	4	do 13...	
do 29...	7 Langshans, 6 Golden Polands.......	9	do 20...	

It will be seen from the above that some of the eggs procured from a distance hatched remarkably well. As instances may be mentioned, 26 Minorca eggs from Guelph, and 13 Andalusian eggs from Toronto, the former giving 23 chicks, and the latter 12. In another case, but later in the season, 15 of the farm eggs resulted in 14 chicks. On the other hand, 13 Buff Cochin eggs from the United States yielded only 4 chicks. As a rule, eggs which come from, or go to a long distance, do not give satisfactory results.

The Sitters—A Few Points.

Full instructions as to the proper management of the sitting hens will be found on page 209 of 1890 report, copies of which can be had on application. A short summary may be useful to those who have not read previous reports.

1. For an early sitter select a medium sized hen.
2. In the early part of the season give 11 eggs. More are apt to be chilled, unless the nest is in a very warm place.
3. If possible set two hens, about the same time. On the fifth or sixth day test the eggs, remove the unfertile ones and give the remainder to one hen, resetting the other.
4. The nest should be made of cut straw, and placed in a quiet spot away from the laying stock. It should be well dusted with carbolic disinfecting powder.
5. China eggs should be placed in the nest, and the sitter allowed to remain on them for two days before the valuable eggs are given to her.
6. Meanwhile the carbolic disinfecting powder has probably rid the body of any vermin.
7. During the hatching period, the nest and hen should occasionally be dusted with disinfecting powder.
8. The sitters and eggs should be examined every morning, to see if all is right.
9. Should an egg be broken in the nest, the others ought to be at once taken out, gently washed in luke warm water and replaced under the sitter. If soiled, the nest straw should be replaced by clean stuff.

10. Machines for testing eggs can be procured at a cheap price from an incubator maker, or a drawing of one may be had from a poultry paper, and a local tinsmith can easily do the rest.

Care of the Young Chicks.

The proper care of young chicks is most important and indispensable to their quick maturing, as market fowls or early layers. And yet few farmers push their young stock with the proper food and frequent feedings absolutely necessary to make plump chickens for market. It is poor economy to hatch out a number of chickens and allow them to die from want of care, proper housing or food, and yet the money lost to the farmers of the country every year from all the causes mentioned is very great. With a little exertion a better quality of poultry could be put on the market by the farmers, and superior quality would soon result in better price. It may be said that young chickens demand close and frequent attention. May not the same be said of every department of the farm ? With this difference that poultry will make a quicker return from date of hatching than any other live stock on the farm. With proper management the cockerels should be marketable in three to four months, and in five to five and a-half months the early pullets should be layers at a time when eggs are high in price. And such results should be obtained in many cases with food, much of which would otherwise be wasted. The proper care and management of chickens from time of hatching to maturity has been gone into at length in 1890 report, page 212. For the information of those who have not seen that report, the following brief recapitulation may be given :—

1. After hatching out, the chickens should remain undisturbed in the nest for 24 hours.

2. Their first feed should be stale bread soaked in milk and squeezed dry, and stale bread crumbs. This may be continued some days.

3. Weather permitting, the hen and brood should be placed in a dry coop on the grass, where the chicks can get at and into the latter.

4. If kept indoors the chicks must be kept on earth, or on boards covered with earth. If not so kept, disaster will follow.

5. After being kept on the bread and milk diet for a week, granulated oatmeal or small particles of cracked corn may be added. At the end of two weeks whole wheat may be fed, but not before.

6. Care should be taken that the chicks are in no way stinted during the first five weeks of their existence. They should be pushed at all times but require particular attention during the period named.

7. Young stock require frequent but light feeding. It must be remembered that a stinted chicken will never make a good market fowl.

8. The earlier hatched, the sooner will the pullets lay.

9. The aim should be to have the pullets laying while the hens are moulting. A supply of new laid eggs all the year round will so be secured.

One of the obstacles in the way of obtaining early chickens is the difficulty of obtaining early sitters. This may be overcome by the use of a good incubator. As artificial incubation becomes simplified and results more certain, so will it become more generally adopted. Again, if the farmer's hens laid as well during the winter season, as they ought to do and will do, if properly managed, there would be more early sitters.

Growth of the Chickens.

The experience of the past five years shows that the Plymouth Rock cockerels make the most rapid growth of any breed so far tried. A cross of Brahma-Dorking during the past season grew quickly and attained large size making 4 lbs. in 3 months and 15 days. The following weights show the progress made by the breeds mentioned.

Plymouth Rocks.

Five cockerels hatched on the 10th May weighed on the 2nd August following :—
2 lbs. 07 ; 2.05 ; 2.02 ; 2.01 ; 1.10.

The same birds weighed on the 14th September, 5 lbs. ; 4.11 ; 4.06 ; 4.04; 3.07.

BUFF COCHINS.

Three cockerels hatched on the 20th May weighed 2 lbs 03 ozs.; 1.15; 1.15 on 2nd August.

LANGSHANS.

Three cockerels hatched on the 20th June weighed on the 17th September 3 lbs; 2·07 lbs. and 2·12 lbs. On the 20th December the same birds weighed 6·03 lbs., 6·02 lbs. and 6 lbs.

CROSSES.

The following will show the progress made with the crosses named:—

Brahma-Dorking Cockerel—Hatched on 18th April; weighed on 2nd August, 4 lbs.; on 6th September, 5 lbs., 14 oz.; on 18th October, 7 lbs., 12 oz. This has been the most satisfactory cross so far made.

White Leghorn-Brahma cross—Two cockerels hatched on 20th May, weighed on 15th September 3 lbs., 7 oz., 3 lbs. 6 oz.; on 28th October, 5 lbs.; 4 lbs., 15 oz.; on 20th December, 6 lbs., 4 oz; 6 lbs.

The pullets of the last named cross promise to make large fowls and excellent layers. A pullet hatched on 20th May laid her first egg on the 4th December. On the same day a pullet of the same age, but of the White Leghorn-Plymouth Rock cross, also laid her first egg. The females of the White Leghorn-Plymouth Rock cross have been found hardy fowls and good winter layers. The Brahma cross is being tried for the first time.

JULY CHICKENS.

Taken as a whole the progress of the chickens was very satisfactory. In no case did a Plymouth Rock, Brahma, Langshan or White Leghorn chick die. All exhibited vigour and hardiness from their hatching. Careful note was taken of the progress of the chickens hatched in July. They were slower to get on their legs than the earlier ones, and despite care, good feeding and precautions against lice, several wilted away and died. In some cases it was a difficult matter to rid the ailing chicks of lice, indeed the latter seemed to take to the weaklings. There can be no doubt that July chicks have a trying ordeal to undergo, for they have to withstand the intense heat of the midsummer months on one hand and the chill fall rains on the other. The early hatched chicks are the most profitable for the farmer. The hatching of late chickens should be avoided, but when impossible to do otherwise the growing stock should be kept under trees in preference to any other kind of shade.

BEGINNING OF WINTER LAYING.

The hens went into winter quarters at the end of November. Most of them appeared to be over their moulting by that time. During their moulting the hens had a free run and were generously fed. An Andalusian pullet hatched on the 12th of May was the first to lay, on the 21st November. A Plymouth Rock pullet, hatched on the 10th May, was next to follow on the 24th of the same month. A pullet of the White Leghorn-Brahma cross, hatched 2nd June, laid first egg on 14th December. A pullet of the White Leghorn-Plymouth Rock cross, hatched on the same day as last named, laid on the same day.

The first hens to lay after moulting were the White Leghorns, Black Minorcas, Andalusians, Plymouth Rocks, Langshans, Wyandottes and Red Caps, in the order named.

AN EXPERIENCE OF COLD WEATHER.

The day before last Christmas was remarkable for the weather becoming exceptionally cold. With few variations the low temperature has continued to date, 14th January. On one occasion the thermometer registered 30 below zero, and the cold was accompanied by a piercing north-west wind. In the farm poultry houses the cold was severely felt, the lowest point marked by the thermometer on the 24th December was as follows:—

Main poultry building			20	below	freezing.
No. 2	do	do	22	do	do
No. 3	do	do	24	do	do

During the cold period mentioned the Black Minorcas, Andalusians, Plymouth Rocks, Red Caps and the White-Leghorn-Brahma Crosses laid the most eggs. This goes to strengthen the statement made in report of last year "that the breeds which are often stated to be the most unsuitable to cold climates do really lay the best." But if eggs are wanted in winter the laying stock must be kept in a temperature where their combs will not freeze. Better still, if they can be kept where the water will not freeze. It may be said that few farmers have fowl houses wherein the water will not freeze. But the farmers, as a rule, do not give the attention required to make their poultry revenue makers, in winter. When they do, they will find that the same reason and system is required to attain success in this branch, as is demanded by every other. What would be said of the farmer who would give as an excuse for not having potatoes during the winter that he allowed them to stay out until frozen. And how many crops of eggs are lost from the hens standing out until injured by cold. An important point to remember is that, when the laying stock are kept in cold quarters, the food which should go into eggs, goes to keeping up the animal heat. Again, the vegetable food is frozen so that it cannot be eaten, and the droppings remain solid until mild weather permits of their removal. Space will not permit further remarks on the subject, but comfortable quarters for the laying stock are necessary if the farmer wishes to be successful in obtaining eggs at a time when they are highest in price.

Rations for Laying Stock.

The following are the rations for the laying stock :—

Morning Warm Ration.—5 lbs. shorts ; $2\frac{1}{2}$ lbs. pea meal ; 2 lbs. corn meal ; 2 lbs. ground meat ; 2 lbs, oats ; with boiled vegetables occasionally mixed. At times fine ground oyster shells were added.

P. M. Ration.—20, 24 or 26 lbs of wheat.

Vegetables, such as mangels, turnips and carrots were regularly supplied.

This ration was fed to the following stock.

List of Poultry.

The poultry at present on hand numbers :—

Breeds.	Cocks.	Cockerels.	Hens.	Pullets.
Brahmas	1	9	6	16
Red Caps	1	5	5	6
Langshans	1	11	3	8
Plymouth Rocks	1	3	11	9
White Leghorns	1	12	17	12
Wyandottes	1	2	9	6
Buff Cochins	—	2	3	1
Andalusians	2	3	11	7
Black Minorcas	1	13	4	13
Mixed	—	1	29	—
Coloured Dorkings	—	—	3	—
Golden Polands	1	2	3	4
Houdans	—	—	11	1
White Leghorn—Brahma Cross	—	4	—	6
do P. Rock do	—	1	—	1
Black Hamburgs	—	—	4	—
	10	68	119	90
				119
				68
				10
				287
Wild Geese				6
Total	......	......	......	293

Diseases of Poultry.

During the year numerous enquiries were made by letter, and in person, by those living in the neighbourhood, as to numerous ailments from which their stock were suffering. In many cases the symptoms described were difficulty of breathing, clogging of the nostrils, swollen head, emaciation, &c., &c., all of which are symptoms of roup. As has been emphasized in previous reports, in all cases of this disease, it is better to kill the ailing fowl and burn or bury its remains, or the others will surely be contaminated. Roup often follows cold, but is sometimes inherited, and in such cases shows itself first in the weaklings. Often times before the symptoms of the disease are detected, several fowls are suffering from it, and the curing of them is at all times wearisome, and in many cases impossible. It will rarely pay a farmer to attempt to cure a fowl sick with roup, for if he is successful such recovered fowls usually breed poor stock and it is not desirable to raise weakling chickens, or to breed from the same, should they struggle to mature growth.

Summary.

The following summary of information given in previous reports will be useful to those who have not read them :—

Select the best layers for the winter pens.

Supply the layers with bones, oyster shells and vegetables.

Kill the drones for they eat the profit made by the good layers.

Get out as many chickens as possible in time for the early grass.

When properly managed poultry and small fruits are said to be a paying combination.

Keep the layers, if possible, in a temperature where the drinking water will not freeze.

With proper care the cockerels should be fit for market in three to four months; and the pullets become layers in five to six months.

The laying stock should be supplied in winter with all the material necessary for making the eggs.

The best layers will generally be fonnd to be the most active ones.

The Black Minorcas are rapidly coming to the fore as winter layers.

Where the water is kept from freezing, it is of special advantage to the hens with large combs.

In cold poultry houses the food instead of going into eggs goes to keep up the animal heat.

Fowls divided into small colonies lay more eggs than when crowded together.

Keep no layer over two years, for it then moults so late that all future profit is eaten up before it commences to lay.

Intelligent and systematic management is as necessary in the poultry department as it is in every other line of business.

Eggs Different in Colour and Weight.

As large eggs are in demand for shipment it is well to know the difference in the eggs laid by the breeds as named and some of which are among the best known to farmers.

Black Minorcas—Large white eggs—Hen's eggs weighing $2\frac{2}{3}$ to $2\frac{1}{4}$ ozs. each ; per dozen 1 lb. 11 ozs. ; pullet's eggs each 2 ozs.; per doz. 1 lb. 7 ozs.

Andalusians—Large white eggs—Hen's eggs each weighing $2\frac{1}{7}$ to $2\frac{1}{4}$; per doz. 1 lb. 11 ozs.

White Leghorns—Large white eggs—Hen's eggs each $2\frac{1}{4}$; per dozen 1 lb. 10 ozs. to 1 lb. 11 ozs. ; pullet's eggs each $1\frac{9}{10}$ oz.; per dozen 1 lb. $7\frac{7}{8}$ ozs.

Houdans—Large white eggs—Hen's eggs each $2\frac{1}{4}$; per dozen 1 lb. 11 ozs. to 1 lb. 13 ozs.

Brahmas—Large dark coloured eggs—Hen's eggs $2\frac{1}{4}$ to $2\frac{1}{2}$ ozs. each ; per dozen 1 lb $9\frac{1}{2}$ ozs. to 1 lb. 13 ozs.

Buff Cochins—Large dark coloured eggs—Hen's eggs vary in size, some going as high as $2\frac{1}{4}$ ozs., others $1\frac{2}{3}$ each.

Wyandottes—Medium sized dark coloured eggs—Hen's eggs weighing 1 lb. 9 ozs. per dozen; pullet's eggs each 2 ozs.; per dozen 1 lb. 7 ozs.

Plymouth Rocks—Eggs of large or medium size according to strain—Hen's eggs each $2\frac{3}{8}$ ozs.; per dozen 1 lb. 9 ozs. to 1 lb. 11 ozs.; pullet's eggs each 2 ozs.; per dozen, 1 lb. $6\frac{1}{8}$ ozs.

Red Caps—White or lightly coloured eggs of medium size. Single egg, 2 ozs.; per dozen 1 lb. $7\frac{1}{5}$ ozs. to 1 lb. 8 ozs.

Visitors were more numerous during the past than in any previous year. The letters received and the questions asked in them by farmers, have greatly increased in number and indicate growing interest in the poultry department as a means of revenue.

I have the honour to be, sir,

Your obedient servant,

A. G. GILBERT,
Manager Poultry Department.

Central Experimental Farm,
Ottawa, 15th January, 1893.

EXPERIMENTAL FARM FOR THE MARITIME PROVINCES.

REPORT OF W. M. BLAIR, SUPERINTENDENT.

To WILLIAM SAUNDERS, Esq.,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith the following report of the operations on the Experimental Farm for the Maritime Provinces at Nappan, N.S., during the year 1892.

WHEAT.

The winter of 1891–92 was mild with only a few days sleighing. The spring was dry and cold extending into June, with a very warm and dry July. In consequence of this drouth the roots and vegetables were a light crop, about two-thirds of an average.

Seeding commenced on 21st April, this being the earliest period since we commenced farm work here, and with fine harvest weather, excepting the first week of August, nearly all crops were gathered in good condition.

MANURE.

The barnyard manure available during the past year was supplemented with about 200 dollars worth of special fertilizer, such as superphosphate and ground bone, and in every instance there has been a marked increase of crop where these were applied to the land.

HAY.

Hay on the marsh land was a light crop while that on the upland was heavy; on the former there was about 42 tons of English and 20 tons of Broadleaf, and on the latter there was about 50 tons. This was all secured in good condition.

WHEAT.

Eleven varieties of winter wheat were sown on clover sod ploughed under on plots of one fortieth of an acre each. A statement of the results are given below.

WINTER WHEAT.

Seed sown.	Name.	Date of Sowing.	Harvested.	Yield per acre.	Lbs. per bushel.	Condition when cut.
Lbs				Bush.		
3	Tasmania	Sept. 9	August 1	50	61¾	Long bright straw; some lodged.
3	Canadian Velvet Chaff	do 9	do 6	50	60	Medium straw; some rust.
3	Manchester	do 9	do 5	50	61½	Stiff straw; some rust.
3	Martin's Amber	do 9	do 8	45	60	do do
3	Democrat	do 9	do 5	42½	61½	Stiff bright straw.
3	Golden Cross	do 9	do 1	40	60¾	Stiff red straw.
3	Volunteer	do 9	do 1	40	61	Long red straw; some rust.
3	Early Red Clawson	do 9	do 5	40	60	Stiff bright straw.
3	Royal Red	do 9	......	......	......	Entire failure.
3	White Queen	do 9	......	......	......	do

The Royal Red and White Queen were two varieties imported from England selected as among the best of the many fine sorts recently offered.

Spring Wheat.

Fifteen varieties of spring wheat were sown, as stated below, in plots of one-twentieth of an acre each. Four and one-half pounds of seed was sown on each plot, with the results given.

Names.	Sown.	Harvested	Yield per Acre.	Weight per Bushel.	Condition when cut.
			Bush.	Lbs.	
Rio Grande	April 27	Aug. 27	30	60	Long, stiff, bright straw.
White Connell	do 27	do 29	35	58¼	Long, stiff straw; some rust.
Gehun	do 27	......	......	......	
Saxonka	do 27	do 27	20	59	Medium straw, stiff; very rusty.
Defiance	do 27	do 27	25	55	Long, stiff, bright straw.
Campbell's Triumph	do 27	do 25	25	59	Medium stiff straw; some rust.
Ladoga	do 27	do 25	20	59	Long, stiff straw; some rust.
Pringle's Champlain	do 27	do 25	20	58	Long, stiff, bright straw.
Wellman's Fife	do 27	do 31	35	57	do do
White Delhi	do 27	......	......	......	
Campbell's White Chaff	do 27	do 25	30	56	Long, stiff straw; some rust.
White Russian	do 27	do 25	30	58	Long, stiff, bright straw.
Colorado	do 27	do 22	35	60	Long, stiff straw; some rust.
Australian	do 27	do 22	25	54	do very rusty.
Red Fern	do 27	do 25	30	58	Very long, stiff, bright straw.

Barley.

Sixteen varieties of barley were grown in plots of one-twentieth acre each. Four and three-quarter pounds of seed were sown on each plot, with the results stated below.

Names.	Sown.	Harvested	Yield per Acre.	Weight per Bushel.	Condition when cut.
			Bush.	Lbs.	
Duck-bill	April 28	Aug. 17	45	49	Medium strong and bright straw.
Rennie's Improved	do 28	do 8	50	49	Large, coarse, stiff and bright straw.
Prize Prolific	do 28	do 17	50	48½	Short, weak straw; some rust.
Odessa	do 28	do 8	60	46	Medium soft straw; bright.
Danish Chevalier	do 28	do 23	45	47	Short, soft, bright straw.
Kinver (Webb's)	do 28	do 23	25	48	Very short, soft, bright straw.
Oderbruch	do 28	do 9	55	48	Medium soft, bright straw; much lodged.
Mensury	do 28	do 13	50	45	Medium bright; a little smutty.
Baxter's Six-rowed	do 28	do 8	45	47	Medium soft and bright straw.
Goldthorpe	do 28	do 25	45	47	Large, bright and soft straw.
Two-rowed Naked	do 28	do 13	35	59	Very short, fine straw; some lodged.
Guymalaye	do 28	do 16	45	57	Medium coarse, stiff straw; some rust.
Thanet	do 28	do 16	55	50	Short, weak straw; much rust.
New Golden Grains	do 28	do 17	60	49	Medium weak straw rusty; some lodged.
Saale	do 28	do 22	40	50	Medium stiff, straw bright.
Golden Melon	do 28	do 22	55	49	do do

OATS.

Thirty-four varieties of oats were also grown in plots of one-twentieth acre each; four and a quarter pounds of seed being sown in each case excepting in that of Rennie's New Oat, on this plot only three pounds of seed was sown from which the following results were obtained :—

Name.	Sown.	Harvested	Yield per Acre.	Weight per Bush.	Condition when cut.
			bush.	lbs.	
Giant Cluster........	April 29..	Aug. 29..	75	35	Large, stiff, bright straw.
Abundance..........	do 29..	do 22..	85	36	do do
Early Etampes..........	do 29..	do 20..	75	34	Very short, stiff, dark straw.
Prolific California.......	do 29..	do 20..	65	33	Coarse, stout and bright straw.
Black Brie..............	do 29..	do 31..	65	36	Large, stiff, bright straw.
Doncaster Prize,........	do 29..	do 22..	75	35	do do
Improved Ligowo......	do 29..	do 17..	75	36	Long, fine, stiff bright straw.
Joanette...............	do 29..	do 20..	80	35	Short, stiff, bright straw.
American Beauty.......	do 29..	do 20..	85	35	Long, stiff, bright straw.
Prolific Black Tartarian.	do 29..	do 22..	70	35	do do
Victoria Prize..........	do 29..	do 15..	65	39	Long, bright straw, much lodged.
Rennie's New..........	do 29..	do 17..	55	34	Very short, stiff, bright straw.
Flying Scotchman.	do 29..	do 13..	70	37¼	Long, stiff, bright straw.
Rennies Prize White....	do 29..	do 12..	55	40½	Short, stiff, bright straw.
Banner...............	do 29..	do 20..	60	34¼	Long, stiff, bright straw.
Cream Egyptian...... .	do 29..	do 19..	50	41	Long, coarse straw.
English White........ .	do 29..	do 14..	55	40	Medium, soft, bright straw, much lodged.
Early Blossom..........	do 29..	do 20..	60	37	Long, stiff, bright straw.
White Russian..........	do 29..	do 23..	70	39	do do
Improved Black Tartarian....	do 29..	do 23..	60	37	do do
Holstein Prolific........	do 29..	do 23..	85	33	Long, coarse, bright straw.
Challenge (Webb's).	do 29..	do 14..	55	41¼	Short, soft, bright straw; some lodged
Prize Cluster.....	do 29..	do 16..	40	40	Medium, weak and bright straw; some lodged.
Early Archangel........	do 29..	do 17..	55	39½	Stout, strong, bright straw.
Early Gothland.........	do 29..	do 23..	50	37	Medium, stiff, long, bright straw.
Bonanza............. ...	do 29..	do 15..	55	41¾	Long, soft, bright straw; some lodged
New Zealand.	do 29..	do 29..	70	36	Large, stiff, bright straw.
Poland White..........	do 29..	do 16..	60	40½	Long, coarse, soft straw, much lodged
Hazlett's Seizure... .. .	do 29..	do 16..	45	40½	Medium, stiff, bright straw.
Rosedale..............	do 29..	do 23..	40	38	Large, bright, stiff straw.
American Triumph......	do 29..	do 29..	55	34	Large, soft, bright straw.
Early Racehorse........	do 29..	do 15..	60	41	Medium, stiff, bright straw.
Welcome.	do 29..	do 16..	65	40	Large, bright, stiff straw.
Canadian Triumph......	do 29..	do 15..	65	42	Large, bright, medium stiff straw; lodged.

Early and Late Sowing.

In order to test the relative value of early and late sowing, a field was laid off in plots of one-tenth of an acre each, and sown at six different times, commencing on 27th April, one week intervening between each sowing, the same kind of grain in all cases being sown. There were two plots each of Wheat, Barley and Oats. The following table gives the results :—

Wheat sown at different times.

Nine Pounds on each Plot.	Sown.	Harvested.	Yield per Acre.	Weight per Bushel.
			bush.	
1—Pringle's Champlain	April 27	Aug. 23	30	61
Campbell's White Chaff	do 27	do 23	22½	60
2—Pringle's Champlain	May 4	Aug. 24	27½	60
Campbell's White Chaff	do 4	do 24	20	58
3—Pringle's Champlain	May 11	Aug. 31	22½	59
Campbell's White Chaff	do 11	do 31	17½	55
4—Pringle's Champlain	May 18	Aug. 31	12½	54
Campbell's White Chaff	do 18	do 31	12½	50
5—Pringle's Champlain	May 25	Sept. 2	17½	57
Campbell's White Chaff	do 25	do 2	12½	52
6—Pringle's Champlain	June 1	Sept. 5	10	50
Campbell's White Chaff	do 1	do 5	10	47

Oats sown at different times.

Eight and a-half Pounds on each Plot.	Sown.	Harvested.	Yield per Acre.	Weight per Bushel.
			bush.	
1—Prize Cluster	April 27	Aug. 17	37½	41
Banner	do 27	do 23	67½	37
2—Prize Cluster	May 4	Aug. 19	45	40¼
Banner	do 4	do 24	67½	36
3—Prize Cluster	May 11	Aug. 22	42½	39½
Banner	do 11	do 27	75	35
4—Prize Cluster	May 18	Aug. 27	40	35
Banner	do 18	Sept. 1	55	32
5—Prize Cluster	May 25	Aug. 29	32½	38
Banner	do 25	Sept. 3	55	32
6—Prize Cluster	June 1	Aug. 31	35	34
Banner	do 1	Sept. 5	55	30

BARLEY sown at different times.

9½ Pounds of Seed being used on each Plot.	Sown.	Harvested.	Yield per Acre.	Yield per Bushel.
			bush.	
1—Baxter's six-rowed	April 27	Aug. 8	42½	48
Carter's Prize Prolific	do 27	do 15	35	49
2—Baxter's six-rowed	May 4	do 8	42½	49
Carter's Prize Prolific	do 4	do 17	47½	48
3—Baxter's six-rowed	do 11	do 10	55	46
Carter's Prize Prolific	do 11	do 27	42½	45
4—Baxter's six-rowed	do 18	do 18	40	44½
Carter's Prize Prolific	do 18	do 29	50	43
5—Baxter's six-rowed	do 25	do 20	35	41½
Carter's Prize Prolific	do 25	Sept. 3	32½	45
6—Baxter's six-rowed	Jnne 1	Aug. 27	30	40
Carter's Prize Prolific	do 1	Sept. 10	25	46

PEASE.

Twenty-five varieties of pease were sown in small plots, one pound of seed being used in each case, the following were the results obtained :—

Names.	Sown.	Harvested.	Remarks.
Duke of Albany	May 3	Aug. 15	Medium yield.
Telephone	do 3	do 14	Fair yield.
Champion of England	do 3	do 14	do
Steele Bros.' Extra Early	do 3	do 2	Medium good yield.
Extra Early Brittany	do 3	do 12	Good yield.
Laxton's Supreme	do 3	do 12	do
Early Blue Imperial	do 3	do 15	Fair yield.
Ringleader	do 3	do 2	Good yield.
Sratagem	do 3	do 4	Poor yield.
Laxton's Alpha	do 3	do 5	do
First and Best	do 3	do 2	Good yield.
Blue Peter	do 3	do 2	Fair yield.
Horsford's Market Garden	do 3	do 13	Good yield.
American Wonder	do 3	do 2	do
Bliss' Abundance	do 3	do 8	Fair yield.
Kentish Invicta	do 3	do 7	Yielded well.
Extra Early Star	do 3	do 2	Fair yield.
Early Kent	do 3	do 3	do
Tom Thumb	do 3	do 2	Poor yield.
Pride	do 6	do 15	Heavy yield.
Rennie's No. 10	do 6	do 15	Very heavy yield.
Prince Albert	do 6	do 13	Heavy yield.
Mummy	do 6	do 15	do strong growth
White Marrowfat	do 6	do 15	Good yield.
Crown	do 6	do 12	Heavy yield.

Mixed Grain.

Tests conducted for the purpose of ascertaining the results as to quantity and weight of the products from sowing different mixtures of grain, to determine which mixture will give the largest amount of feed per acre.

Seven acres of poor land was selected for the purpose and divided into one acre plots, this land had a dressing of one barrel of Archibald's Fertilizer per acre.

The following table gives the quantity and kinds of seed per acre and the returns:—

Total Number of bush. Sown per acre.	Varieties.	Sown.	Harvested.	Bush. per acre.	Weight per bush.
					Lbs.
2¼	Pease, 1¾ bush. Wheat, ½ do	May 6	August 18	11½	58
2½	Pease, ½ bush. Wheat, 1 do Oats, 1 do	do 6	do 17	19	43½
3	Oats, 1¼ bush. Barley, 1¼ do Pease, ½ do	do 6	do 17	18½	41
3	Oats, 2½ bush. Pease ½ do	do 6	do 18	23½	41
2½	Pease	do 6	do 19	19½	62½
3	Oats	do 6	do 18	26	38½
2¾	Wheat, ¾ bush. Barley, 1 do Oats, 1 do	do 6	do 18	16½	37

Cross-bred Wheats.

Six varieties of cross-bred wheats received from the Central Farm at Ottawa were sown with the following results:—

Amount of Seed Sown.	Varieties.	Sown.	Harvested.	Lbs. per Plot.	Condition when cut.
2 ounces.	Carleton	May 5	August 24	1¾	Long bright weak straw.
2 do	Ottawa	do 5	do 24	2¼	Medium stiff straw, rusty.
2 do	Alpha	do 7	do 24	¾	Long stiff straw, some rust.
2 do	Prince	do 7	do 24	2	Medium stiff straw, rusty.
2 do	Beta	do 7	do 24	1¾	Short stiff straw, rusty.
4 do	Abundance	do 7	do 24	4½	Long stiff straw, rusty.

Turnips.

Fourteen varieties of Turnips were sown on 26th May, consisting of three rows, 30 inches apart and 66 feet long, of each kind. Duplicate plots of the same varieties were sown on 8th June. The following table gives the results :—

Varieties.	1st Plot Sown.	2nd Plot Sown.	1st Plot Pulled.	2nd Plot Pulled.	1st Plot Weight.	2nd Plot Weight.
					Lbs.	Lbs.
Rennie's Prize Purple Top Swede	May 26	June 8	Oct. 18	Oct. 18	500	445
Rennie's Elephant, or Giant King	do 26	do 8	do 18	do 18	340	235
Bangholm Purple Top Swede	do 26	do 8	do 18	do 18	480	470
Carter's Elephant Swede	do 26	do 8	do 18	do 18	380	427
Carter's Prize Winner	do 26	do 8	do 18	do 18	470	470
Sutton's Champion Purple Top	do 26	do 8	do 18	do 18	500	417
Hartley's Bronze Top	do 26	do 8	do 18	do 18	360	330
Mammoth Purple Top	do 26	do 8	do 18	do 18	475	450
Bronze Top Extra	do 26	do 8	do 18	do 18	375	365
Jumbo, or Monarch	do 26	do 8	do 18	do 18	370	325
Steele Bros. Select Purple Top	do 26	do 8	do 18	do 18	430	375
Marquis of Lorne Purple Top	do 26	do 8	do 18	do 18	335	312
Rennie's Novelty Swede	....	do 8	do 18	....	450	......
Davey's Swede	....	do 8	do 18	....	525	....

The last named Turnip was from a small quantity of seed kindly sent me by Mr. Davey, the English delegate who visited the farm last year in company with Mr. McQueen. These gave the heaviest crop. He also sent at the same time a small package of mangels, but these latter did not yield as well as some other sorts tried. See Statement of Mangels.

Mangels.

Thirteen varieties of Mangels were sown in plots of three rows each, 66 feet long with 30 inches between each row. These were sown on 26th May, and a duplicate plot of each kind was sown on 8th June, with the following results :—

Varieties.	1st Plot Sown.	2nd Plot Sown.	1st Plot Pulled.	2nd Plot Pulled.	1st Plot Weight.	2nd Plot Weight.
					Lbs.	Lbs.
Pearce's Canadian Giant	May 26	June 8	Oct. 17	Oct. 17	420	495
Carter's Warden Prize Yellow Globe	do 26	do 8	do 17	do 17	335	355
Mammoth Long Red	do 26	do 8	do 17	do 17	495	465
Gate Post or Long Red	do 26	do 8	do 17	do 17	270	265
New Giant Yellow Intermediate	do 26	do 8	do 17	do 17	512	385
Golden Fleshed Tankard	do 26	do 8	do 17	do 17	335	270
Red Fleshed Tankard	do 26	do 8	do 17	do 17	175	190
Red Globe	do 26	do 8	do 17	do 17	329	330
Berkshire Prize	do 26	do 8	do 17	do 17	300	220
Red Globe Oberndorff Extra	do 26	do 8	do 17	do 17	250	220
Rennie's Mammoth Long Red	do 26	do 8	do 17	do 17	367	325
Yellow Globe Select	do 26	do 8	do 17	do 17	280	187
Yellow Globe (Davey's)	June 8	....	do 17	....	300	....

Carrots.

Twelve varieties of carrots were sown on 27th May in three rows 66 feet long, and 24 inches between the rows, with duplicate plots of each sown on 8th June. The results are stated below :—

Varieties.	1st Plot Sown.	2nd Plot Sown.	1st Plot Pulled.	2nd Plot Pulled.	1st Plot Weight.	2nd Plot Weight.
					Lbs.	Lbs.
Guerande or Oxheart	May 27	June 8	Oct. 14	Oct. 14	455	277
Improved Short White	do 27	do 8	do 14	do 14	395	30
Giant White Belgian	do 27	do 8	do 14	do 14	475	280
Manitoba White Intermediate	do 27	do 8	do 14	do 14	500	350
Danver's Orange	do 27	do 8	do 14	do 14	375	140
Carter's Orange Giant	do 27	do 8	do 15	do 15	325	240
Pearce's Improved Half Long White	do 27	do 8	do 15	do 15	350	300
Giant Short White Vosges	do 27	do 8	do 15	do 15	400	215
Mammoth Smooth White	do 27	do 8	do 15	do 15	470	295
Early Gem	do 27	do 8	do 15	do 15	415	315
Chantenay	do 27	do 8	do 15	do 15	395	290
Iverson's Champion White	do 27	do 8	do 15	do 15	485	280

Sugar Beets.

Four varieties of sugar beets were sown in 3 rows, each 66 feet long and 30 inches between the rows with the results given below :—

Varieties.	Sown.	Pulled.	Weight of Plot.
			Lbs.
Brabant	May 27	Oct. 19	132
Kruger	do 27	do 19	113½
Klien Wanzleben	do 27	do 19	225
Vilmorin's Improved	do 27	do 19	118½

Potatoes.

Forty-six varieties of potatoes were planted in 2 rows, each 66 feet long. Date of planting, character of growth and yield are given below :—

Varieties.	Planted.	Dug.	Sound.	Rotten.	Remarks.
			Lbs.	Lbs.	
Rural Blush	May 27	Sept. 20	93	....	Growth strong; medium tuber; late.
Chicago Market	do 27	do 20	74	11	Growth medium; long tuber; late.
Brownell's Winner	do 27	do 20	77	8	Growth strong; medium long tuber; late.
Halton Seedling	do 27	do 20	72	13	Growth weak; small round tubers; early.
Thorburn	do 27	do 20	110	17	Growth weak; medium smooth tuber; late.
Early Rose	do 27	do 19	107	17	Growth weak; medium tubers; early.
Algoma	do 27	do 19	102	11½	Growth weak; medium tubers; early.
Richter's Schneerose	do 27	do 20	120	....	Growth strong; large, round tubers; late.
Early Eating	do 27	do 19	61	....	Growth weak; small round tubers; late.
White Star	do 27	do 20	99	....	Growth weak; small round smooth tubers; early.
Beauty of Hebron	do 27	do 19	115	11	Growth strong; medium tubers; early.
Rose's New Giant	do 27	do 19	83	4	Growth strong; long large tubers; late
Clarke's No. 1	do 27	do 20	85	10	Growth strong; medium long smooth tubers; late.
Stray Beauty	do 27	do 19	161	....	Growth strong; large medium tubers; early.
London	do 27	do 19	114	10	Growth weak; medium tubers; early.
Crown Jewel	do 27	do 20	71	20	Growth strong: round tubers; early.
Acadian	do 27	do 19	101	....	Growth strong; large flat tubers; late.
Lee's Favourite	do 27	do 19	110	18	Growth weak; medium tubers; early.
Early Maine	do 27	do 19	83	....	Growth weak; small tubers; early.
Rural New Yorker No. 2	do 27	do 20	67	....	Growth strong; long round smooth tubers; late.
Richter's Improved	do 27	do 20	93	....	Growth strong; medium smooth tubers; late.
Wonder of the World	do 27	do 20	90	....	Growth weak; long flat smooth tubers; late.
Burbank Seedling	do 27	do 20	93	4	Growth weak; long round smooth tubers; late.
King of Earlies	do 27	do 20	45	....	Growth strong; small round tubers; late.
Delaware	do 27	do 20	113	....	Growth strong; large round tubers; late.
Early Puritan	do 27	do 19	122	....	Growth strong; long tubers; late.
Great Eastern	do 27	do 19	104	13	Growth strong; long round tubers; late.
Conqueror	do 27	do 20	86	4	Growth strong; round smooth tubers; late.
Scherburn's Late Rose	do 27	do 19	99	14	Growth medium; small tubers; late.
Mammoth Prolific	do 27	do 19	79	2	Growth strong; medium tubers; late.
Early Callao	do 27	do 20	60½	....	Growth strong; small round tubers; early.
Centennial	do 27	do 20	76	....	Growth strong; large round tubers; late.
Late Goodrich	do 27	do 20	76	....	Growth strong; small round tubers; late.
Compton's Surprise	do 27	do 20	117	....	Growth strong; large rounds smooth tubers; late.
Muchonic	do 27	do 20	102	....	Growth strong; large round tubers; late.
Large Callao	do 27	do 20	56	7	Growth weak; small round tubers; late.
Black Montana	do 27	do 20	93	....	Growth medium; large round tubers; late.
Richter's Elegant	do 27	do 20	143	....	Growth strong; long pink tubers; early.
Rosy Morn	do 27	do 20	109	12	Growth strong; medium tubers; early.
Empire State	do 27	do 20	66	....	Growth strong; large smooth tubers; late.
Silver Dollar	do 27	do 20	111½	6	Growth strong; medium tubers; late.
Early Sunrise	do 27	do 19	118	10	Growth strong; large smooth tubers; early.
Sugar	do 27	do 19	73	4	Growth medium. small round tubers; late.
Dakota Red	do 27	do 20	92	6	Growth strong; large round smooth tubers; late.

Flax.

Two plots of flax were sown, Russian and White; the latter was a failure; the former gave 12 bushels per acre, and was found to be a valuable food for calves and horses, either scalded with hot water and mixed with feed, or ground and mixed.

Vetches.

A plot of White Vetches were sown for seed, with the following results—the land was poor and weedy:—30 lbs. of seed sown 6th May, harvested 15th August, gave 6 bushels. Weight per bushel, $62\frac{3}{4}$ lbs.

Buckwheat.

Two varieties of buckwheat were sown, with the following results:—

Varieties.	Sown.	Harvested	Remarks.
Silver Hull	June 9	Sept. 2	7 bush. sown; 54 bush. harvested.
Japan	do 9	do 2	10 lbs. sown; $3\frac{1}{2}$ do

Millet.

Nine varieties of millet were sown, and also one of Canary seed. The former did fairly well. The canary seed grew and ripened well, and appears to be well adapted to this climate. The following are the results:—

Varieties.	Sown.	Harvested	Remarks.
Hungarian Millet	May 30	Sept. 29	Fair growth; filled out medium well.
Branching do	do 30	do 29	Strong growth; filled out well.
Round White Millet	do 30	do 29	Weak growth; filled out fairly well.
California Green Millet	do 31	do 29	Weak growth.
Red Millet	do 31	do 15	do filled out and ripened well.
Choice Round White Millet	do 31	do 15	Strong growth do do
Italian Millet	do 30	Oct. 3	Very strong growth; not filled out.
Black Millet	do 30	Sept. 15	Strong growth; filled out and ripened well.
Golden Wonder	do 30	Oct. 3	Very strong growth; poorly filled out.
Canary Seed	do 31	Sept. 15	Medium strong growth; filled out well.

Sunflowers.

A plot of sunflowers were sown, which made a strong growth and ripened well Sown 8th June, harvested 12th October.

Corn.

Thirteen varieties of corn were sown in two rows each, in hills three feet apart each way and 66 feet long, with the results as given below :—

Varieties.	Sown.	Harvested.	Weight per plot.	Remarks.
			Lbs.	
Smut Nose Flint	June 7	Sept. 26	230	Tasselled, Aug. 26 ; silked, Sept. 10 ; in late milk, Sept. 26.
Mammoth Sweet	do 7	do 28	420	Tasselled, Sept. 20 ; silked, Sept. 28 ; ears just forming.
Red Cob Ensilage	do 7	do 28	450	Tasselled, Sept. 24 ; no silk ; no ears.
Angel of Midnight	do 7	do 26	280	Tasselled, Aug. 22 ; silked, Aug. 30 ; soft glazed, Sept. 26.
Longfellow	do 7	do 26	195	Tasselled, Sept. 5 ; silked, Sept. 25 ; in late milk, Sept. 26.
Pride of the North	do 7	do 26	265	Tasselled, Sept. 2 ; silked, Sept. 15 ; in early milk, Sept. 26.
Crosby's Early Sugar	do 7	do 26	200	Tasselled, Sept. 2 ; silked, Sept. 22 ; soft glazed, Sept. 26.
Mitchell's Extra Early	do 7	do 26	50	Tasselled, Aug. 2 ; silked, Aug. 22 ; hard glazed, Sept. 26.
Mammoth Southern Sweet	do 7	do 28	440	Tasselled, Sept. 24 ; silked, Sept. 28 ; no ears.
Thoroughbred White Flint	do 7	do 28	280	do Sept. 17 do do 28 do
Cinquantine	do 7	do 26	80	do Aug. 20 do do 2 ; hard glazed, Sept. 26.
North Dakota	do 7	do 26	195	Tasselled, Aug. 30 ; silked, Sept. 13 ; in early milk, Sept. 26.
Pearce's Prolific	do 7	do 26	280	Tasselled, Sept. 1 ; silked, Sept. 22 ; soft glazed, Sept. 26.

There was also planted one acre of corn in hills three feet apart each way, one half of this was planted with Pearce's Prolific and one half with Longfellow. This acre gave 19,730 lbs of corn well wilted.

Another acre was planted in rows three feet apart and thinned out to 5 and 6 inches between the plants, one half being planted with Pearce's Prolific, the other half with Longfellow as above, this acre gave 25,770 lbs of corn well wilted.

Bordeaux Mixture for the Prevention of Potato Rot.

A thorough test was made of the Bordeaux Mixture as applied to potatoes for the prevention of rot, the first application was made on July 25th and the second on August 25th. For this purpose a plot consisting of five varieties, embracing both early and late kinds was selected. This plot was divided across the middle ; one half was treated and the other was left untreated.

This mixture is made by dissolving 3 pounds of Blue Stone, in eleven gallons of water, and slacking 2 pounds of Lime in water and after it is well slacked strain out the coarser particles through a coarse cloth and mix the creamy fluid with the other liquid, —a thin salt bag makes a good strainer,—this is applied with a sprayer to the plants when they are about one foot high, and again just about ten days or a fortnight later. The plants so treated kept green until the frost struck them, while the others not treated withered and dried up. The whole plot was treated with Paris green twice for the prevention of the potato bug. The weight of tubers both rotted and sound are given below

	Names.	Treated with Bordeaux Mixture.		Not Treated.	
		Sound.	Rotted.	Sound.	Rotted.
Oct. 8	Early Sunrise	115 lbs.	0 lbs.	118 lbs.	30 lbs.
do 8	Acadian	180 do	0 lbs.	194 lbs.	13 lbs.
do 8	Muchonic.	283 do	0 lbs.	272 lbs.	13½ lbs.
do 8	Sugar	119½ do	0 lbs.	79½ lbs.	8 lbs.
do 8	Dakota Red	191 do	0 lbs.	133 lbs.	2 lbs.

Beans.

Nineteen varieties of beans were planted in small plots, the date of planting and harvesting and character of growth is stated below. The Early Mazagan proved to be a much better variety than the Broad Windsor, being a larger cropper and earlier.

Varieties.	Sown.	Harvested.	Condition when Picked.
Giant Red Wax............	June 8..	Sept. 30.	Growth poor; very few ripe.
Henderson's Bush Lima. ...	do 8..	do 30..	do medium; none ripe.
Black Wax	do 8..	do 30..	do medium; none ripe; good early table variety.
Crystal White Wax.	do 8..	do 30..	do medium; very few ripe.
Yellow Six Weeks	do 8..	do 30..	do strong; all ripe; second best cropper.
Early Garden Cluster Wax..	do 8..	do 30..	do strong; none ripe; best early table variety.
Dwarf German Black Wax..	do 8..	do 30..	do medium; one half ripe; good cropper.
Cranberry	do 8..	....	Very poor.
Yosemite Mammoth Wax...	do 8..	Sept. 30..	Growth medium; none ripe.
Dwarf German White Wax..	do 8..	do 30..	do medium; nearly all ripe; good cropper.
Mammoth Red German Wax	do 8..	do 30..	do medium; one half ripe.
Broad Windsor....	do 8..	Oct. 12..	do strong; none ripe.
Red Speckled.	do 8..	....	Very poor.
Flageolet Wax	do 8..	....	do
Royal Dwarf Kidney........	do 8..	Sept. 30..	Growth medium; one half ripe; good cropper.
Early Dun Coloured.........	do 8..	do 30..	do strong; all ripe; best cropper.
Early Mazagan..	do 8..	Oct. 12..	do very strong; some ripe.
Canadian Wonder...........	do 8..	Sept. 30..	do medium; few ripe.
Golden Andalusian Wax....	do 8..	... .	Very poor.

The beans and pease are not taken into consideration in general statement of quantity of grain.

General Statement of Crops.

In addition to the plots of grain already referred to which gave 451 bushels, there were 11 acres in oats which gave 499½ bushels, and 4 acres in buckwheat that gave 54 bushels of grain, and in addition to the plots of roots already mentioned there were 4 acres in turnips which yielded 2,820 bushels, making in all, including plots of roots, about 3,920 bushels. There was also 2 acres devoted to green crop for summer feed for cattle, and 3 acres to small fruits, grasses and forest trees.

Nine acres of land was underdrained this year, making in all 69 acres of the farm now drained. All the drains are proving satisfactory.

Road making has also been carried on this year, as time from other work would permit.

Buildings.

Three new buildings have been erected this year, one for swine, another for storing carts, waggons, implements and tools of all kinds, one end of which is fitted up for poultry, with roomy yards adjoining. A part of the third building is used for light carriages, sleighs, harness, etc., and a part for a workshop which is very useful in stormy weather for cleaning harness, sorting and cleaning grain, etc. The upper story of this building is used as a store room for samples of grain, etc.

These buildings were much needed and are very convenient, and with the additional accommodation they have given we have been able to remove the remaining old buildings previously used for storing purposes.

Water Supply.

The system of water supply has been completed, and so far has proved satisfactory This was accomplished by digging a large well on the higher upland some 2,000 feet from the buildings and stoning it up. Into this well the water from several small springs near by was conducted by means of tile. The water from this well, which is 25 feet above the barnyard level, is carried by a 1¼ inch galvanized iron pipe to the barn and stable, with ½ inch pipe in the dwelling house. Thus far the supply of water has been ample and continuous.

Cattle.

The cattle bought last year for fattening purposes were sold in April for the St. John, N.B., market.

No steers have been purchased this year to fatten, but some experiments are being carried on in feeding a few yearlings of different grades raised on the farm. With a few exceptions the cows have done well and there is a good increase of promising young stock.

Ornamental Trees and Shrubs.

The trees and shrubbery planted last year with a few exceptions came through the winter well and made a good growth this season. Those that failed were replaced in the spring, and when the fall came were strong and healthy.

The young forest trees in the nursery are growing rapidly, especially the Manitoba Maple or Box Elder, many of which are now $2\frac{1}{2}$ feet high, from seed planted in May, 1891.

Small Fruits.

All the small fruits did well this year. Insects were rather troublesome, but constant attention with hellebore has kept them in check.

Fruit Trees.

The young orchard of apple trees is doing well, a few trees had to be replaced this year also some of the plums and pears that died during last winter.

The orchard has been extended by the addition of apple, plum, cherry and pear trees which, with a small addition the coming spring, will fill the ground at present allotted for orchard purposes. Some of the trees produced fruit this season, and all made a good strong growth. The Wagener, Scott's Winter, Jonathan, Haas, Maiden's Blush, Tetofsky and Longfield gave some good specimens. The Longfield produced a heavy crop, so much so that much of the fruit, when forming, had to be picked off, even then the limbs in some instances broke under the weight of apples; the limbs are long and slender and the wood appears to be soft.

Exhibitions.

Some of the products of the farm was shown at New Glasgow and Sackville exhibitions. The exhibit consisted of grain in straw and bottles, and also potatoes. A large collection has been arranged for the Chicago exposition, consisting of grain in straw and in bags. A large quantity of roots and vegetables, partly the growth of the Experimental Farm and partly collected from farmers in Nova Scotia and New Brunswick, has been shipped to Chicago. Four hundred and nineteen sample bags of grain and potatoes were distributed among farmers for test from here during the year.

Meetings Attended.

I attended the annual meetings of the New Brunswick Farmers and Dairyman's Association, at Fredericton, on March 24 and 25; also the Dairyman's Association, at Amherst, on 29th and 30th of March; a public meeting, at Amherst, on 4th April; a farmers' meeting at Pugwash, on April 8, one at Wallace, on April 9; also attended a meeting of farmers at River John, Pictou county, on 28th and 29th of June, and two meetings of farmers in Cumberland county, during the year.

I have the honour to be, sir,

Your obedient servant,

W. M. BLAIR,

Superintendent.

EXPERIMENTAL FARM FOR MANITOBA.

REPORT OF S. A. BEDFORD, SUPERINTENDENT.

BRANDON, MAN., 24th December, 1892.

To WM. SAUNDERS, Esq.,
Director Dominion Experimental Farms,
Ottawa.

SIR.—I submit herewith my fifth annual report of the experiments undertaken and the work accomplished on the Brandon Experimental Farm during 1892. Although five small plots of grain were sown on this farm on the 6th of April, seeding was not general until the 14th of that month, or fully a week later than the average season. On the 26th of April, after nearly all the wheat was sown here the weather again turned cold, and heavy snow fell, delaying further seeding until 7th May, from that date until the end of June the weather was favourable and growth rapid. On 30th June the thermometer dropped to 3 below freezing, injuring many of the tender vegetables, and discolouring the blades of oats and wheat. This frost, and the following two weeks of excessive dry weather is no doubt answerable for the shortness of straw so general throughout the northern and central parts of the province. From the 15th July to 20th August the weather was in every respect favourable to the growing crops, but from the 20th to the 29th of that month it was excessively hot, so much so that the ripening grain had not sufficient time to fill properly, and much of it, especially that on poorly farmed, weedy land produced a small yield and a shrunken kernel. Frost sufficient to injure grain was not experienced on this farm until 13th September, when all but two plots were harvested. Although the yield of grain throughout the province this year is below the average, the quality is excellent, and millers agree that the sample, though small in the berry, is the best milling wheat grown here for years. The returns per acre on the Experimental Farm during the past year were not equal to that of 1891, still the yields are fair, and the almost total absence of injury from wind or frost makes the year one of the most successful for experimental purposes since the farm was established.

In accordance with your instructions that the work of the farm should as much as possible follow certain lines each year, and a considerable area of land on the farm being in excellent condition this spring for the accurate testing of varieties of grain, special attention has been paid to this, and some other portions of the work curtailed. During the year a total of 169 plots have been sown with wheat, with oats 102, and 86 plots with barley, field pease, &c. The season being particularly free from storms and injurious frosts, a large amount of reliable data has been obtained regarding the numerous varieties tested. Having now the results of tests made during three seasons, I would suggest that the sowing of a large number of the least promising of the varieties be discontinued, and that special attention be paid to the cross-bred sorts originated on the several Experimental Farms, and to any other new varieties that may be obtained.

WHEAT.

As usual this cereal has received a large share of attention, no less than 103 plots being devoted to a test of different varieties. Having three distinct characters of soil available and in excellent condition for wheat, a number of the most promising sorts were sown in triplicate—one series of plots being in the south-east corner of the valley portion of the farm on stiff clay loam, similar to much of the land found in the Red

River valley, the second series were sown on rich black loam of somewhat lighter character, while the third series were on upland prairie, soil a gravelly loam. The soil chosen for the first two series was remarkably uniform, and the results therefore may be regarded as reliable, the upland, although selected with every care, was slightly undulating, and for that reason was not quite uniform in character.

The following varieties of wheat were grown here for the first time this year, and a slight description of them may prove useful.

Emporium, a heavily bearded wheat, is similar in appearance to the Eureka and Red Fern, and as these three varieties of wheat mature in the same number of days and yield about the same, they are no doubt identical.

Goose Wheat is a variety well known in Ontario, but is not generally grown here, it is a bearded wheat with a large heavy head ; it matures altogether too late for this country, and should it ripen in a favourable season, the quality of the grain would make it objectionable.

Democrat Spring is somewhat similar to Goose Wheat, and like it of doubtful quality and late in maturing.

Black Sea is a long strawed bearded wheat, five days earlier than Red Fife, but has not equaled it in productiveness ; being early, it should, however, be tested another season.

Bearded Red is a stiff-strawed bearded variety, not at all productive this year ; it is early and should be given another trial.

Test of Varieties of Wheats on Clay Loam.

Varieties of wheat sown on stiff clay loam April 20; first crop after breaking, sown with common drill seven pecks per acre ; bluestoned 1 lb. to 10 bushels ; no smut or rust on any of the varieties ; size of plots, one-fifth acre.

Variety.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight per Bushel.	Ripe.	Days in maturing.	Yield per Acre.	
	Inch.		Inch.		Lbs.			Bush.	lbs.
Green Mountain	35	Stiff	3	Bald	60½	Aug. 29	131	41	15
Red Fife	45	do	3½	do	61	do 30	132	40	32
Hungarian Mountain	42	do	3¾	do	60½	do 29	131	40	10
White Fife	43½	do	3½	do	60	do 29	131	38	20
White Connell	40	do	3½	do	59½	do 29	131	38	5
Old Red River	39	do	.....	do	59½	do 30	132	38	20
Colorado	39	do	3	Bearded	62	do 22	124	37	55
Ladoga	42	do	3	do	58	do 18	120	36	20
Red Connell	43	do	3½	Bald	60	do 29	131	34	15
Wellman's Fife	48	Fair	4	do	60¼	do 29	131	31	55
Campbell's White Chaff	35	Stiff	3½	do	60	do 27	126	31	50
Eureka	41	do	4	Bearded	60	do 24	126	31	40
Emporium	39	do	4	do	58	do 24	126	31	5
Golden Drop	40	Fair	2½	Bald	60	do 24	126	30	50
Blue Stem	44	Stiff	4	do	60	do 30	132	30	5
White Russian	42	Fair	4	do	59	do 30	132	29	..
Carter's F	47	Weak	4½	do	56	Sept. 1st	134	25	50
Hard Red Calcutta	25	Fair	2½	Bearded	61½	Aug. 10	112	17	45

Note.—The weights per bushel given here, and also with all other grain tables in my report, are not the maximum weights that the grain could be brought to, but were taken from grain cleaned to a condition fit for milling purposes only.

Test of Varieties of Wheat on Black Loam.

Results of wheat tests sown on black loam in the valley, on April 22nd, land summer-fallowed the previous year, sown with Press Drill, six pecks per acre, bluestoned no smut, Blue Stem, Australian and Carters I slightly rusted, balance free from rust, size of plots one tenth of an acre.

Variety.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight per Bushel.	Ripe.	Numer of days Maturing.	Yield per Acre.	
	Inch.		Inch.		Lbs.			Bush.	Lbs.
White Connell	40	Stiff	3	Bald	60½	Aug. 28	128	38	
White Fife	40	do	4	do	60½	do 28	128	38	
Pringle's Champlain	37	do	3	Bearded	61	do 22	122	38	
Red Fife	39	do	3	Bald	59	do 30	130	37	50
Hungarian Mountain	42	do	3½	do	60½	do 29	129	37	50
Blue Stem	43	do	4	do	59½	Sept. 2	133	34	20
Old Red River	38½	do	3	do	60	Aug. 25	125	33	20
Colorado	39	do	3	Bearded	60	do 23	123	33	20
Club	38	do	3	Bald	60	do 24	124	33	10
Assiniboine	47	Very weak	3	Bearded	61	do 22	122	32	10
Waugh's Delhi	36	Stiff	1½	Bald	58½	do 24	124	32	10
Green Mountain	38	do	3	do	61½	do 25	125	32	
Carters F	44	Weak	5	do	56	Sept. 3	134	31	30
Nameless	48	Stiff	6½	Bearded	60½	Aug. 25	125	31	
Defiance	41	do	3	Bald	60	do 24	124	30	40
Eureka or Red Fern	46	do	3½	Bearded	58	do 26	126	30	20
Campbell's White Chaff	35	do	3	Bald	60	do 27	127	30	10
Johnston's	38	do	4	do	55	do 26	126	30	10
Kent	38	do	2½	do	59	do 24	124	30	
Emporium	45	Stiff	3½	Bearded	58	Aug. 26	126	29	40
Ladoga	38	do	3	do	58	do 24	124	28	50
White Russian	40	do	3½	Bald	58½	do 29	129	28	30
French Imperial	47	do	3½	do	61	do 26	126	27	50
Wellman's Fife	41	Fair	4½	do	61	do 28	128	26	40
Chilian White	43	Stiff	3	Bearded	60	do 24	124	26	10
Carters I.	48	Very weak	3½	Bald	55	do 30	130	25	50
Red Connell	38	Stiff	3	do	59	do 26	126	23	50
Indian Karachi	27	do	2		59	do 20	120	22	40
Campbell's Triumph	40	do	2½	Bald	60½	do 24	124	20	50
Golden Drop	40	do	3	do	60	do 25	125	20	00
White Delhi	19	do	2	Mixed	58½	Ag. 15 to 24		20	00
Gehun	27	do	2	Bald	60	Aug. 20	120	17	50
Club Bombay	20	do	2	Bearded	61	do 15	115	16	40
Hard Red Calcutta	28	do	2½	do	61½	Aug. 10	110	14	40

Test of Varieties of Wheats on Upland Prairie.

Test of 31 varieties of wheat, sown on upland prairie, April 25th, soil light loam, summer fallow, sown with common drill seven pecks per acre, all bluestoned, no smut, Black Sea, Carters F, Goose and Gehun slightly rusted, balance free from rust.

Variety.	Length of straw.	Character of straw.	Length of head.	Kind of head.	Weight per bushel.	Ripe.	Days in maturing.	Yield per acre.	
	Inch.		Inch.		Lbs.			Bush.	Lbs.
Defiance	33	Stiff	3	Bald	55	Aug. 26	123	28	30
Blue Stem	43	do	3½	do	58	do 27	124	26	50
Red Connell	36	do	3	do	59	do 26	123	26	40
Campbell's W. Chaff	37	do	6	do	60	do 24	121	25	50
Old Red River	33	do	3½	do	55	do 26	123	25	50
Club	32½	do	3	do	59	do 26	123	25	10
Hungarian Mountain	33	do	3	do	55½	do 26	123	24	54
White Connell	36	do	3¼	do	61½	do 25	122	24	40
Red Fife	35	do	3½	do	60	do 27	124	24	30
Democrat Spring	40	Fair	......	Bearded	61	Sept. 17	145	24	30
Carters F	39	Stiff	4	Bald	53	Aug. 27	124	24	22
Waugh's Delhi	38	do	2	do	59	do 22	119	24	10
White Fife	36	do	3½	do	60	do 26	123	23	10
Johnston's	36	do	3	do	57	do 26	123	22	30
Goose	43	do	3½	Bearded	60	Sept. 7	135	21	52
Campbell's Triumph	31	do	3	Bald	53	Aug. 26	123	21	50
Summer Cob	38	do	3½	do	59	do 26	123	21	40
Black Sea	40	do	6	Bearded	61½	do 22	119	20	10
Onega	31	do	3	do	59	do 19	116	20	..
Ladoga	38	do	3	do	60½	do 20	117	19	40
Wellman's Fife	33	do	3½	Bald	59	do 26	123	19	30
Chilian White	32	Fair	......	Bearded	60	do 25	122	19	10
Great Western	35	do	4	do	62	do 23	120	18	40
Karachi	29	Stiff	3	... .	54	do 18	115	18	20
White Delhi	19	Fair	3	Mixed	50	do 18	115	18	10
Russian Hard Tag	28	do	4	Bearded	61½	do 22	119	18	10
Bearded Red	38	Stiff	4	do	60	do 22	119	15	30
Gehun	23	Crinkled	4	Mixed	62	do 18	115	15	20
Soft Red Calcutta	23	Stiff	3	Bearded	62½	do 19	116	12	30
Hard Red Calcutta	27	Fair	4	do	59	do 19	116	12	..
Club Bombay	19	Stiff	3	do	62	do 19	116	9	10

Cross-bred Wheats.

Five cross-bred wheats, originated at the Central Experimental Farm, Ottawa, have been tested here during the year, the amount of seed was only sufficient to sow a plot of each variety eleven feet square; for that reason the yield per acre has not been given. Alpha, Carleton and Prince have been obtained by crossing Ladoga, female, with White Fife, male, Ottawa and Beta from Ladoga, female, with Red Fife, male.

For comparison an adjoining plot was sown with Red Fife at the same time.

The dates of ripening are given as closely as could be ascertained with such small plots, for owing to the large proportion of outside edge it is always difficult to get reliable dates of ripening from such small areas, The Alpha gave the best sample of grain, it is somewhat longer in the berry than the Red Fife and is quite clear and hard. All were sown on May 16th.

Variety.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Rust.	Smut.	Ripe.	Yield per Plot.
Alpha	31 inches	Stiff	3 inches	bald	None	None	Aug. 25	3 lbs. 9 oz.
Ottawa	36 do	do	3½ do	bearded	do	do	do 22	3 lbs. 3 oz.
Carleton	30 do	do	2½ do	do	do	do	do 26	1 lb. 15 oz.
Prince	32 do	do	3½ do	do	do	do	do 27	1 lb. 14 oz.
Beta	31 do	do	3 do	do	do	do	do 26	1 lb. 7 oz.
Red Fife	32 do	do	3½ do	bald	do	do	Sept 4	3 lbs. 7 oz.

The use of Barnyard Manure in Growing Wheat.

The impression is generally prevalent throughout the province that the use of barnyard manure has the effect of causing a rank growth of straw and thereby delaying the ripening of the crop. So general is this impression that many farmers avoid using manure and thousands of loads of manure are either burnt or deposited on the ice of our rivers to be carried away in spring. To test this question three plots of one-tenth acre each were selected, two of these were treated with manure and the third plot sown without manure, below will be found particulars of this experiment.

Red Fife sown with Press Drill on wheat stubble, ploughed in spring, soil gravelly loam.

Variety.	When Sown.	How treated.	Length of Straw.	Ripe.	Yield per Acre.
Red Fife...............	April 25..	Fresh manure 20 tons per acre...	31 inches..	Aug. 19...	20·50 bush.
do	do 25..	Rotted do do ...	29 do ..	do 19...	21·10 do
do	do 25..	No manure.....................	31 do ..	do 24...	20·40 do

It will be seen from the above:—

1st. That the plots treated with manure gave slightly the largest yield of grain but no longer straw.

2nd. That both of the manured plots ripened five days earlier than the unmanured. This experiment should be repeated for a number of years on varying soils, and if it is found that the use of manure generally hastens the ripening of grain it will be a great inducement for farmers to go more extensively into mixed husbandry, and to utilize all stable manure produced on the farm.

Results from the application of Superphosphate of Lime and Salt to Wheat.

At the request of the Manitoba Central Farmers' Institute a test was made during the past season with superphosphate of lime and salt applied to wheat with the object of hastening maturity.

The land selected was in wheat the previous year, and was ploughed and harrowed in the fall, the superphosphate and salt were sown broadcast after the grain was well up; the weather was very dry when the fertilizers were applied, and no rain fell for some time afterwards; the season was therefore unfavourable for the experiment. This will require to be repeated a number of times before any reliable conclusion can be reached.

It will be seen that the returns were largest from the plots treated with salt, and the smaller amount of superphosphate, the date of ripening was not affected by the chemicals.

How Treated.	Variety.	Length of Straw.	Weight per Bushel.	Ripe.	Yield per Acre.	
		Inches.	Lbs.		Bush.	Lbs.
Superphosphate, 250 lbs. per acre......	Red-Fife ...	31	61	Aug. 20....	18	40
do 500 do	do	30	60	do 20....	16	30
Salt, 250 lbs. per acre..................	do	30	60½	do 20 . .	18	20
Untreated..........	do	28	60	do 20....	16	30
Light harrowed twice.................	do	28	60½	do 20....	17	20
Iron harrowed once	do	33	60	do 20....	17	00
Not harrowed........	do	31	59½	do 20....	16	50

A Test of Rolling Wheat Land.

It is seldom advisable to roll land here directly after sowing as it increases the risk of injury from wind storms, but many think the yield is increased if the grain is rolled when a few inches high, and it certainly levels the ground for harvesting.

This year three plots of wheat stubble land; ploughed in the fall were devoted to testing this matter.

The rolling was done with a heavily loaded iron land roller after the wheat had reached six inches high and when the surface soil was dry. None of the plots were injured by wind.

By the following tables it will be seen that land once rolled gave a slightly larger return followed by the unrolled, while the plot rolled twice gave the smallest yield: this result being somewhat contradictory the experiment should be repeated another year.

How Treated.	Variety.	Length of Straw.	Weight per Bushel.	Ripe.	Yield per acre.	
					Bush.	Lbs.
Rolled once	Red Fife	34 inches	60½ lbs	August 20	17	30
Rolled twice	do	36 do	60½ do	do	16	..
Unrolled	do	28 do	60 do	do	16	30

Spring and Fall Ploughing versus Summer Fallow.

The rain-fall of the past season being somewhat below the average was favourable to wheat on summer-fallow and spring ploughing, this result is to be generally expected in this Province and no farmer should depend altogether on fall ploughing; for land worked at that season is in such a loose condition when winter sets in that a large proportion of its moisture is evaporated before Spring and the grain suffers in consequence.

Following this will be found particulars of this year's test of the above modes of preparing land.

The summer fallow was ploughed once on 22nd June, and the weeds kept down during summer by the use of a three horse cultivator.

The fall ploughed plot was harrowed as soon as ploughed and again harrowed in Spring.

The Spring ploughed plot was sown as soon as ploughed, thus promptly retaining the moisture and starting germination.

How Treated.	Sown.	Variety.	Length of Straw.	Weight per Bushel.	Ripe.	Yield per acre.	
						Bush.	Lbs.
Spring Ploughing	April 22	Red Fife	31 inches	61 lbs.	August 20	28	10
Fall Ploughing	do	do	31 do	59½ do	do	16	50
Summer Fallow	do	do	39 do	59 do	August 30	38	20

Drill Tests with Wheat.

Besides the usual tests of different kinds of machines for sowing grain, two plots were devoted to comparing results with chain coverers against press wheels. The work was done equally well by both coverers—neither plot suffered from wind storms—and it will be noticed that there was only a difference of 10 lbs. per acre in the yields.

It is generally thought that the press drill as now constructed makes the drills too far apart. To ascertain whether this is the case one plot was sown with drills the usual width, 7 inches, and the adjoining plot $3\frac{1}{2}$ inches. It will be seen that the 7-inch drill yielded 1 bushel per acre more than the $3\frac{1}{2}$-inch.

This year's test of drills against broadcast machines has resulted as usual in favour of the drills. All the plots were in an exposed situation, and the press drill plot did not suffer as badly from wind as the others. This accounts largely for the difference in yield and date of ripening.

TEST OF DRILLS.

Variety.	How Sown.	Length of Straw.	Weight per Bushel.	Ripe.	Yield per Acre.	
		Inches.	Lbs.		Bush.	Lbs.
Red Fife, sown April 16.....	Wheels on Superior Drill...	40	60	Aug. 26..	38	..
do do 16.....	Chains do	40	60	do 26..	37	50
do do 6.....	Press Drill, $3\frac{1}{2}$ inches........	34	61	do 23..	36	40
do do 6.....	do 7 do	35	$60\frac{1}{2}$	do 23..	37	40
do do 6.....	Common Drill, 6 inches.....	36	$59\frac{1}{2}$	do 26..	35	25
do do 6.....	Press Drill, 7 inches.........	35	$60\frac{1}{2}$	do 23..	37	40
do do 6.....	Broadcast Machine..........	27 to 36	60	do 26..	33	30

This is the fourth time on this farm that drills have been pitted against broadcast machine, with the result each time that drills have given the largest yield, hence it is evident that drill sowing is preferable on soil similar to that on the Experimental Farm.

The two experiments first mentioned should be repeated before the results are considered final.

Preventives of Smut in Wheat.

Bearing in mind the immense losses sustained by the province, in 1891, through smut, it is unnecessary for me to point out the importance of this subject.

For the past three years experiments with smut preventives have been made on this farm, and they all point to the advisability of using bluestone (Sulphate of copper) for this purpose.

The result of the past season's experiments only emphasise this, and it appears almost criminal for a person to neglect so simple, inexpensive and certain a remedy.

The tedious and often inconvenient mode of soaking the seed in the bluestone liquid, has been found quite unnecessary. A liquid composed of 1 pound of bluestone, dissolved in a pail (10 quarts) of water and simply sprinkled on the seed wheat is quite efficacious and permits of the seed being drilled without drying, the only care necessary is that the grain be constantly stirred while the liquid is being applied, so that all the kernels are moistened.

Tables are herewith submitted, showing the results obtained this year by using various smut preventives. The first four experiments were carried out under instructions from F. T. Shutt, Chemist for the Dominion Experimental Farms, who also prepared the seed for sowing. The remaining three tests were arranged at this farm.

TEST of chemicals to prevent smut, size of plots, 10 feet square; sown broadcast on May 14th; soil, a light gravelly loam.

Variety.	Treatment.	Smutty heads.	Good heads.
Red Fife........	Sulphate of iron........................	116	2,425
do	Agricultural bluestone........................	27	2,275
do	Sulphate of copper (bluestone)........................	4	2,375
do	Sulphate of copper and lime........................	15	2,300
do	Agricultural bluestone and lime........................	72	2,800
do	Untreated........................	190	2,150
Saxonka..........	Sulphate of iron........................	463	1,600
do	Agricultural bluestone........................	30	2,000
do	Sulphate of copper (bluestone)........................	15	2,800
do	Sulphate of copper and lime........................	56	2,600
do	Agricultural bluestone and lime........................	186	2,710
do	Untreated........................	504	2,142
Red Fife........	Sulphate of iron........................	120	2,730
do	Agricultural bluestone........................	36	2,450
do	Sulphate of copper (bluestone)........................	8	2,550
do	Sulphate of copper and lime........................	27	2,260
do	Agricultural bluestone and lime........................	56	2,400
do	Untreated........................	142	2,359

Test of bluestone as a smut preventive, size of plots one fifteenth of an acre, common drill, seven pecks per acre, bluestone liquid sprinkled on the seed, results obtained by counting the wheat heads on ten feet square.

Variety.	How treated.	Weight per Bushel.	Yield.		Smutty Heads.	Heads with no smut.
		Lbs.	Bush.	Lbs.		
Smutty Red Fife............	1 lb. bluestone to 5 bushels........	59½	23	40	22	2,000
do	1 lb. do 10 do	59½	25	40	14	1,800
do	No bluestone........................	58½	19	50	700	1,610

The results from these experiments may be summarized as follows:—

1. That sulphate of iron is of very little use as a smut preventive.

2. That lime used with sulphate of copper for the purpose of lessening injury to the germination of seed is of no use for that purpose, and has a tendency to destroy the effectiveness of the sulphate of copper.

3. Sulphate of copper (bluestone), is decidedly the best preventive used and is remarkably uniform in its action; and that 1 lb. to 10 bushels is as effective as twice that amount.

4. Agricultural bluestone, although next in value to sulphate of copper is still not nearly equal to it as a preventive of smut.

OATS.

The yield of oats this year throughout the province has been somewhat below the average, and the weight owing no doubt to the general prevalence of rust is also light.

The number of varieties of oats tested on the Experimental Farm is larger than usual and includes several kinds newly introduced from the east.

All the varieties being in the one field on apparently uniform soil and receiving similar treatment, the experiment as a comparison of varieties may be considered fairly reliable. None of the plots were injured by wind or frost, the field was in the higher

portion of the valley, and was thoroughly summer-fallowed the previous year, soil a light loam. The crop on this field being remarkably even and free of weeds was a source of interest to visiting farmers during the summer months.

The following varieties of oats were tested for the first time this year :—

Abundance, is a white branching oat fairly stiff in the straw but light in weight owing to rust; it ripens somewhat late, the yield this year was 81 bushels per acre.

Abyssinian is also a white branching oat, it proved weak in straw but yielded 73 bushels per acre of rather light grain and suffered only slightly from the rust, it ripened in 108 days.

Siberian, a white sided or mane oat was fairly productive, yielding 72 bushels but proved very late, taking 118 days to mature : this variety had fairly stiff straw and very little rust.

White Hungarian gave the largest yield (87 bushels per acre) of any oat on the farm, it is a sided or mane oat, the straw was stiff but rusted badly and the grain was in consequence light in weight, it is a late variety.

Challenge White had very long and weak straw which rusted badly but the yield from this variety was 72 bushels per acre, weighing 37 lbs. per bushel, it ripened in 105 days, making it one of our earliest oats.

Giant Cluster, a white sided oat with stiff straw, suffered severely from rust, and was about the last oat on the farm to ripen, the yield was nearly 63 bushels per acre.

Victoria Prize, is a short bearded branching oat, fairly stiff in the straw, which was but slightly rusted; the return from this variety was 70 bushels per acre; it is early, ripening in 105 days.

Doncaster, a white oat with a branching head produced a stiff straw which rusted badly. This variety ripens fairly early, taking only 107 days to mature, and yielded something over 68 bushels per acre of fairly heavy oats.

White Dutch has very weak straw which rusted badly, it yielded 65 bushels per acre, the head is branching and the grain ripens quite early.

Joanette, a black oat with branching head, has thin weak straw, it gave a return of 73 bushels per acre of small light grain; this oat did not rust to any extent,it ripened rather late, taking 111 days to mature.

Early Etampes, another thin weak strawed variety, it rusted more than the Joanette and yielded rather less, it ripened also in 111 days.

Many of these varieties are quite promising but another year's trial at least should be had before they can be intelligently compared with those generally grown in this province.

Varieties of Oats.

A test of varieties of oats sown with a Press Drill on 12th May, eight pecks per acre, on light black loam, summer fallowed. Size of plots, one-tenth of an acre.

Variety.	Number of Days maturing.	Length of Straw.	Character of Straw.	Kind of Head.	Length of Head.	Rust.	Weight per Bushel.	Date of Ripening.	Yield per Acre.
	Dys	Ins.			Ins.		Lbs	1892.	Bush.
White Hungarian	118	47	Stiff	Sided	10	Badly	34	Sept. 7	87·2
Australian	118	45	Fair	Branching	9	None	32	do 7	85·30
Banner	107	46	Stiff	do	10	Considerable	33	Aug. 27	82·12
Abundance	110	45	Fair	do	7	Badly	33	do 30	81·26
Golden Side	111	45	Weak	do	8	do	33	do 31	79·14
Archangel	105	37	Fair	do	8	Little	39	do 25	78·28
Rosedale	107	45	Stiff	½ sided	9	Slightly	37	do 27	76·16
Potato	110	47	Fair	Sided	9	Badly	37	do 30	74·24
Joanette	111	42	Weak	Branching	10	None	34½	do 31	73·18
Abyssinian	108	43	do	do	10	Slightly	34	do 28	73·18
Welcome	105	46	Fair	do	10	do	35½	do 25	72·32
Early Etampes	111	37	Weak	do	8	do	34	do 31	72·22
Challenge White	105	51	Very weak	do	10	Very badly	37	do 25	72·22
Siberian	118	49	Fair	Sided	10	Slightly	38	Sept. 7	72·16
Improved Black Tartarian	108	48	Weak	do	9	Considerable	35	Aug. 28	72·2
Early Gothland	109	45	do	½ sided	8	Slightly	30	do 29	72·2
Improved Ligowo	107	40	Stiff	Branching	8	do	37	do 27	71·16
English White	106	47	Weak	do	10	do	32½	do 26	71·16
White Russian	113	44	Very weak	½ branching	10	do	32	Sept. 2	71·16
Black Champion	108	47	Weak	Sided	10	Considerable	35	Aug. 28	70·30
Victoria Prize	105	44	Fair	Branching	7	Slightly	35	do 25	70·20
American Triumph	120	56	Very stiff	do	11	do	31	Sept. 9	70·20
Holstein	113	47	Stiff	do	9	None	34½	do 2	69·4
Doncaster	107	45	do	do	10	Badly	37	Aug. 27	68·28
Glenrothern	118	36	do	do	10	Considerable	34½	Sept. 7	65·30
White Dutch	105	51	Very weak	do	10	Very badly	35	Aug. 25	65·20
Early Blossom	115	40	Stiff	½ sided	10	Slightly	33	Sept. 4	65·10
Cream Egyptian	96	34	do	Branching	10	do	39	Aug. 16	65·8
Prize Cluster	100	44	do	½ sided	9	do	35½	do 20	63·18
Giant Cluster	121	44	do	Sided	9	Considerable	34	Sept. 10	62·32
Winter Grey	102	47	do	Branching	10	Slightly	38½	Aug. 22	61·26
Bonanza	96	42	Very stiff	do	8	do	40	do 16	60
Early Race Horse	104	47	Fair	do	10	do	36	do 24	58·8
Swedish	118	46	Stiff	Sided	11	do	29½	Sept. 7	58·8
Rennie's Prize White	100	43	Weak	Branching	13	Considerable	36	Aug. 20	50

Barley.

Although the yield of barley here this year has not equalled that of last season the returns are still fair.

The heavy rains on July 16th succeeding a month of very dry weather, started a second growth, the grain from which did not ripen until late ; this seriously injured the color and weight of the sample.

Twenty nine varieties were sown on adjoining plots in the valley ; the soil of these plots was apparently alike in character and the experiment as a comparison of varieties may be taken as fairly reliable.

Twenty one of the same varieties were also sown on higher portions of the farm on gravelly loam, and this field being somewhat undulating the soil was not quite uniform ; the results are however useful showing as they do how the several sorts are likely to succeed on the lighter soils of the Province.

Many varieties were badly lodged here this year, and the necessity of sowing only stiff strawed sorts was more than ever apparent, the Duck-Bill, California Prolific and Goldthorpe among the two rowed, and nearly all the six rowed varieties are of this character and should be sown in preference to those having weaker straw.

Owing to the low price of wheat, barley is at present receiving a large share of attention here and the following suggestions regarding its cultivation are offered.

1. Select clean land, summer-fallow preferred.
2. Never sow barley on fall ploughing ; it is generally too dry.
3. If on spring ploughing, plough, sow and harrow the same day, so as to retain moisture.
4. Always use a drill (press preferred) broadcasting leaves too many grains near the surface to dry out.
5. Sow pure, clean and plump seed of a stiff strawed variety.
6. When harvesting do not neglect Barley altogether for your wheat.

Varieties of Barley.

Results of tests of varieties of barley on black loam soil ; in valley ; sown on 20th May, with press drill, six pecks per acre ; summer-fallow ; size of plots, one-tenth of an acre.

Variety.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight per bushel.	Ripe.	Days maturing.	Yield per Acre.	
	Inch.		Inch.		Lbs.			Bush.	Lbs.
Goldthorpe	34	Very stiff.	3	2 row	51	Sept. 3	106	67	24
Italian	33	Stiff	3	2 do	49½	Aug. 25	97	60	40
Swedish	31	do	4	2 do	52	do 26	98	57	14
Sharpe's Improved	29	do	3½	2 do	51	do 26	98	56	32
Duck-bill	32	do	2¼	2 do	49½	do 25	97	54	28
Phœnix Von Thalen.	31	do	3½	2 do	52½	do 23	95	54	08
Saale	32	Weak	4½	2 do	51	do 30	102	53	46
Prize Prolific	31	Fair	4	2 do	50	do 26	98	52	44
New Zealand	28	Stiff	3½	2 do	53	do 25	97	52	34
Bestehorns	32	Weak	4	2 do	50	do 31	103	52	24
Rennie's Improved, six-row	......	Very stiff.	2	6 do	52	do 16	88	51	42
Prolific	33	Very weak	4	2 do	50	do 26	98	51	22
Danish Chevalier	34	Fair	4	2 do	51½	do 25	97	51	12
Thanet	29	Weak	3½	2 do	51	do 25	97	49	28
English Malting	34	do	4½	2 do	49	do 25	97	48	16
Peacock	33	Stiff	2½	2 do	51	do 25	97	43	16
Beardless	34	Very weak	3½	2 do	50	do 29	101	45	10
Webb's Kinver Chevalier	37	do	4½	2 do	50	do 29	101	45	00
Odessa	34	Stiff	5	6 do	51	do 19	91	45	00
Indian, Kangra District	......	....	.....	6 do	40	Sept. 10	113	43	18
Peerless White	30	Weak	3½	2 do	51	Aug. 25	97	42	44
Rice or Fan	25to35	Stiff	3	2 do	49½	do 26	98	42	14
Mensury	40	do	5	6 do	48	do 19	91	41	02
California Prolific	30	do	2½	2 do	50½	do 25	97	38	46
Selected Chevalier	33	Very weak	3	2 do	51	do 25	97	38	26
Golden Melon	34	Weak	3	2 do	50	do 25	97	36	02
Baxter's six-rowed	34	Stiff	4	6 do	51	do 19	91	32	24
Spiti Valley	20	do	.....	6 do	58	do 14	86	27	44

Barley on Gravelly Loam

Barley sown on gravelly loam, field undulating with a southern exposure, sown on 18th May, with a common drill, seven pecks per acre, land summer fallowed, size of plots one-tenth acre, field not quite uniform.

Variety.	Length of Straw.	Length of Head.	Kind of Head.	Character of Straw.	Ripe.	No. of Days Maturing.	Yield per Acre.		Weight per Bushel.
	Inch.	Inch.					Bush.	Lbs.	Lbs.
Swedish	30	3	2 row	Fair	Aug. 27	101	58	6	52
Prize Prolific	33	4	2 do	Weak	do 27	101	51	32	49½
Sharpe's Improved	31	3	2 do	do	do 27	101	47	34	52
Beardless	28	4	2 do	Fair	do 27	101	44	28	51
Selected Chevalier	32	3½	2 do	do	do 27	101	43	36	51
Danish Printice	31	4	2 do	Weak	do 27	101	42	44	50½
California Prolific	23	3	2 do	Stiff	do 22	96	42	34	49
Thanet	33	3	2 do	Weak	do 27	101	41	42	51
English Malting	34	4	2 do	do	do 27	101	40	20	50
Webb's Kinver Chevalier	33	3½	2 do	do	do 26	100	39	28	51
Danish Chevalier	31	4½	2 do	do	do 27	101	38	36	51½
Goldthorpe	33	3	2 do	Stiff	do 28	102	36	42	49
New Zealand	32	3¾	2 do	do	do 27	101	36	32	52½
Golden Melon	31	4	2 do	Weak	do 27	101	35	20	51
Duck-bill	30	3	2 do	Stiff	do 27	101	34	28	49
Rennie's Improved	24	1½	6 do	do	do 15	89	33	16	52
Odessa	30	2	6 do	do	do 15	89	33	6	49½
Peerless White	31	3	2 do	Weak	do 27	101	32	24	50½
Mensury	20	3	6 do	Stiff	do 22	96	30	10	48½
Baxter's Six-rowed	30	2	6 do	do	do 15	89	30	..	50
Spiti Valley, six-rowed	16	2	6 do	do	do 13	87	19	28	58

Test of Drills with Barley.

This year's experiments with the different kinds of Drills for sowing barley fully corroborate previous tests, and it is evident that with every acre of barley sown with a broadcast machine in this province there is a loss of from five to eleven bushels per acre. This, and the inferior seed used, is largely responsible for the comparatively small yields of barley reported from some parts of the province :—

Variety.	Kind of Drill.	Ripe.	Yield per Acre.	Weight per Bush.
			Bush.	Lbs.
Duck-bill	Press Drill, wheel coverer	Aug. 31	58·16	49
do	do chain coverer	do 31	49·18	49
do	Common Drill	do 31	52·44	49
do	Broadcast	do 31	47·4	48

Early, Medium and Late Sowing of Grain

In accordance with instructions received from the Director a series of experiments were undertaken with a view of determining the proper date for this province to sow the different kinds of grain.

Arrangements were made to sow two plots of one-tenth acre of wheat, oats and barley every Saturday, commencing on 23rd April, a snow storm, however, prevented us sowing on the 30th of April, but with this exception the experiment as at first planned was carried ont.

Red Fife and Campbell's White Chaff wheats, Banner and Prize Cluster oats, Goldthorpe and Kinver Chevalier barleys, were the varieties selected for sowing in each case.

The last two sowings of Red Fife only graded No. 1 frozen, balance was all No. 1 Hard. The last sowing of Campbell's White Chaff was also No. 1 frozen, balance No. 1 Northern.

As an evidence of the uniform character of the soil in this series of experiments I would call attention to the fact that in every instance the yield of Red Fife wheat exceeded the Campbell's White Chaff sown at the same date, and in like manner the Banner gave larger returns than the Prize Cluster, but the Campbell's White Chaff wheat and Prize Cluster oats proved earlier in every case.

It is noticeable that the combined maximum yield of the two varieties of wheat was from the sowing on May 7th, from oats sown May 28th, and barley May 21st. This is not in accordance with our usual expectation; earlier sowing generally giving the largest returns; and can only be accounted for by the late sown grain receiving more benefit from the abundant rain of July 15th, than the earlier sown plots.

A glance at the accompanying table will show a close connection between the dates of sowing and ripening, and should stimulate farmers to sow as early as possible to secure fredom from injury by frost.

WHEAT.

Early, medium and late plots of wheat, one-tenth acre; soil, rich loam; land, summer-fallowed previous year, situated in valley, sown with Press Drill, $1\frac{1}{2}$ bushels per acre.

When Sown.	Variety.	Character of Straw.	Length of Straw.	Length of Head.	Rust.	Weight per bush.	Ripe.	Days in maturing.	Yield per acre.
			Inch.	Inch.		Lbs.			Bush.
April 23..	Red Fife..	Stiff....	36	$3\frac{1}{4}$	None.........	60	Aug. 26	125	33·20
do 23..	Campbell's White Chaff...	do	37	3	do	$59\frac{1}{2}$	do 23	122	32·50
May 7..	Red Fife.................	do	37	$3\frac{1}{2}$	do	59	do 28	113	36·50
do 7..	Campbell's White Chaff...	do	37	$3\frac{1}{4}$	do	$58\frac{1}{2}$	do 26	111	35·30
do 14..	Red Fife.................	do	38	$3\frac{1}{2}$	do	59	do 29	107	37·10
do 14..	Campbell's White Chaff...	do	40	$3\frac{1}{2}$	do	$56\frac{1}{2}$	do 31	109	30·30
do 21..	Red Fife.................	do	39	3	do	59	Sept. 8	110	33·30
do 21..	Campbell's White Chaff...	do	42	$2\frac{1}{2}$	Little on stalk.	$58\frac{1}{2}$	do 2	104	30·50
do 28..	Red Fife.........	do	40	3	None.........	58	do 13	108	29·40
do 28..	Campbell's White Chaff...	do	41	$2\frac{1}{2}$	Little on stalk.	56	do 6	101	24·50
June 4..	Red Fife	do	38	$2\frac{1}{2}$	do ..	58	do 15	103	28·00
do 4..	Campbell's White Chaff...	do	40	2	Stalk badly...	57	do 10	98	19·30

OATS.

Early, medium and late plots of Oats, one-tenth acre ; soil, gravelly loam, summer-fallowed previous year, situated on the upland prairie, sown with Press Drill, 2 bushels per acre.

When Sown.	Variety.	Character of Straw.	Length of Straw.	Length of Panicle.	Rust.	Weight per bush.	Ripe.	Days in maturing.	Yield per acre.
			Inch.	Inch.		Lbs.			Bush.
April 23..	Prize Cluster..............	Stiff ...	41	9	Little	35½	Aug. 12	111	30·30
do 23..	Banner....................	do	38	9½	Considerable..	33½	do 22	121	59·24
May 7..	Prize Cluster..............	do	41	9	Little	37	do 15	100	33·8
do 7..	Banner....................	do	36	9	Considerable..	31½	do 26	111	70·10
do 14..	Prize Cluster..............	do	42	9	Little	34½	do 17	95	33·8
do 14..	Banner....................	do	42	9	Considerable..	32	do 27	105	69·5
do 21..	Prize Cluster..............	do	42	9	Little	31	do 25	96	50·30
do 21..	Banner....................	do	45	9	Considerable..	31½	do 29	100	60·10
do 28..	Prize Cluster..............	....	41	9	Little........	33	do 25	89	55·30
do 28..	Banner....................	....	42	8	Considerable..	34	Sept. 1	96	62·22
June 4..	Prize Cluster..............	Stiff....	45	9	do ..	34	Aug. 28	85	53·18
do 4..	Banner....................	do	45	7	Little	34	Sept. 7	95	60·2

BARLEY.

Early, medium and late plots of barley, one-tenth acre. Soil, gravelly loam, summer fallowed previous year, upland prairie. Sown with Press Drill. Two bushels per acre.

When Sown.	Variety.	Character of Straw.	Length of Straw.	Length of Head.	Rust.	Weight per Bushel.	Date of Ripening.	Days in Maturing.	Yield per Acre.
1892.			Ins.	Ins.		Lbs	1892.		Bush.
April 23..	Kinver Chevalier............	Stiff	32	3½	Badly	52½	Aug. 15..	114	40·20
do 23..	Goldthorpe..................	do	37	3	Considerable ..	51	do 24..	123	50·20
May 7..	Kinver Chevalier......... ..	do	31	4	Badly	52½	do 23..	108	50·00
do 7..	Goldthorpe	do	39	3½	Considerable ..	51	do 27..	112	55·30
do 14..	Kinver Chevalier..........	do	30	4	Badly	52	do 26..	104	51·32
do 14..	Goldthorpe	do	39	3½	None..........	51½	do 30..	108	51·32
do 21..	Kinver Chevalier..........	Weak	35	4	Badly	50	do 28..	99	51·22
do 21..	Goldthorpe	Very stiff.	38	3½	None..........	50	Sept. 7..	109	64·28
do 28..	Kinver Chevalier..........	Very weak	31	3½	do	49	Aug. 30..	94	52·34
do 28..	Goldthorpe	Very stiff.	35	3	do	49½	Sept. 7..	102	61·2
June 4..	Kinver Chevalier............	Very weak	35	3½	do	50	do 7..	95	61·33
do 4..	Goldthorpe	Very stiff.	35	3	do	49½	do 12..	100	53·19

FIELD PEASE.

When we consider how well field pease have succeeded on this farm it is surprising that farmers generally do not grow them more extensively, the yield here has always been fair and the sample excellent, the ready sale and good prices obtainable for pease and their usefulness for fattening purposes should induce farmers to cultivate them more largely.

On the Experimental Farm the following treatment has been found suitable for this crop.

Sow only on soil naturally well drained.

It is useless to attempt their cultivation on weedy land, weeds grow so rank here that they soon choke the pease.

Well rotted back-setting or clean summer fallow are suitable.

Sow as deep as possible with a drill, from 2½ bushels to 3½ bushels per acre according to size of pease.

Multiplier, Crown and Prince Albert are all suitable varieties for this country.

A number of new varieties of peas have been grown here this year; among them the Potter, a medium-sized grain, and the Pride, a larger pea, are quite promising. The Daniel O'Rourke is a handsome pea and very early; the supply of seed of this variety being small, we are not able to give the yield per acre. All the varieties were sown on summer fallow with a common drill, two and a half to three and a half bushels per acre; soil a gravelly loam; size of plots one-tenth of an acre.

Variety.	When Sown.	Length of Straw.	Length of Pod.	Ripe.	Yield per Acre.
					bush.
Crown	May 7	23 inches	2 inches	Aug. 27	31·50
Prince Albert	April 25	53 do	2¾ do	do 31	31·40
Potter	May 7	34 do	3¾ do	Sept. 1	30·40
White Eyed Marrowfat	do 7	40 do	3 do	do 1	30·00
Multiplier	April 25	50 do	2¾ do	Aug. 31	29·00
Pride	May 7	23 do	3 do	do 25	28·20
Early Field	April 25	28 do	2 do	do 24	26·40
Prussian Blue	May 7	35 do	2½ do	do 30	22·30
Black Eyed Marrowfat	April 25	40 do	3 do	Sept. 7	21·00
Mummy	do 25	35 do	2 do	do 7	19·40
Daniel O'Rourke	do 25	35 do	2 do	Aug. 1	.....

Buckwheat.

Seven varieties of buckwheat were grown this year; all were sown with a Planet Junior drill, in rows one foot apart, and kept free from weeds during the season of growth. As this crop is often used for the purpose of green manure, 6 x 15 feet of each plot was weighed in the green stage.

The yield of seed was calculated from the produce of a plot 6 x 115 feet, and such large yields per acre must not be looked for from large fields grown with ordinary field culture.

Variety.	In Bloom.	Ripe.	Height.	Weight of Green Straw per Plot.	Yield of Grain per Acre.
					bush.
Rye Buckwheat	July 30	Aug. 17	46 inches	45 lbs	51·28
Tartarian Buckwheat	do 30	do 18	44 do	55 lbs	50·12
Common do	do 26	do 17	46 do	40 lbs	38·17
Silver Skin do	do 26	do 15	56 do	35 lbs	37·1
Japan do	do 28	do 20	47 do	30 lbs	34·18
Grey do	do 24	do 16	58 do	42 lbs	33·3
Nepaul do	do 26	do 17	53 do	20 lbs	31·35

Seed Grain Distribution.

The distribution of seed grain from the farm has greatly increased during the past year: 344 parcels have been sent out principally in two bushel lots, a fair price has been charged in each case, and reports are coming in daily regarding its success in different parts of the country, these will be useful for reference and will be compiled when another year's experience has been obtained.

Mixed Grain for Hay and Green Fodder.

The success of the experiments undertaken here last year with mixed grain for hay and green fodder attracted considerable attention, and many farmers anticipating a light yield of wild hay have this year grown large areas of this useful crop.

Last year the land used for this purpose was all summer-fallow, but realizing that farmers have very little fallow land to spare for this purpose, a change to stubble land, spring ploughed was made this year; for this reason, the yield is somewhat lighter, but is still good.

In addition to the combinations used last year it will be noticed that a mixture of wheat and pease has been tried with satisfactory results.

All were sown on May 27th, with a Press Drill, as pease and tares succeed best if grown alone, these were first sown east and west, and then the other grain north and south, although this plan gives double labour in sowing, the increased gain in fodder more than pays for the extra work.

Mixed grain for hay and green fodder.

Variety.	Pecks per Acre Sown.	Stage when cut.	Weight per Acre. Dry. Tons.	Dry. Lbs.	Green. Tons.	Green. Lbs.
Oats—Black Tartarian Tares—Large English	8 8	In early milk Podded	3	975	6	1,850
Oats—Black Tartarian Pease—Multiplier	8 8	In early milk Podded	3	925	4	1,950
Wheat—Eureka Pease—Multiplier	6 8	In early milk Podded	3	925	4	1,950
Barley—Duck-bill Pease—Multiplier	7½ 8	In early milk Podded	3	300	4	1,625
Barley, 1st cut—Rennie's six-rowed Tares do —Large English	7½ 8	In early milk Podded	2	25	6	250
Barley, 2nd cut—Rennie's six-rowed Tares do —Large English	7½ 8	Commencing to head. In bloom	1	1,550	....	
Rye, 1st cut—Spring Tares do —Large English	8 8	Late milk Podded	1	1,125	2	1,675
Rye, 2nd cut—Spring Tares do —Large English	8 8	In head In bloom	1	25	1	1,000

Grasses.

The past severe winter coupled with the light snow-fall in this portion of the province was unusually injurious to nearly all the imported clovers and grasses and the following were completely killed on this farm, Sanfoin, Lucerne, Mammoth Red, Common Red, Bokhara, and Yellow Clovers.

The following cultivated grasses were also winter killed, Orchard Grass, Perrennial and Italian Rye Grass.

As the cultivated Rye Grasses and Yellow Clover have now been tried on this farm for three seasons and have always been winter-killed, it may be safely concluded that they are too tender for this province.

The other varieties of clover and grasses mentioned above, stood the winter of 1890–91 without injury and should receive further trial before they are condemned for this country.

The following were quite hardy, but owing to the very dry weather in the early part of the season the return from them was light, Timothy, Bromus inermis, Hard and Sheep Fescue and White Dutch Clover.

Native Grasses grown under Cultivation.

I have great pleasure in reporting continued success with the native grasses.

Although grown on similar soil the native varieties are found to withstand both drought and frost much better than Timothy, and have this year yielded from two to three times as much hay per acre.

The plots sown with the native grasses in 1889 are still vigorous, and it is evident that they are all true perennials and not likely to run out quickly.

In addition to the small plots sown in 1889, a number of larger plots have been sown on different parts of the farm each spring since then, these have all given large returns during the past season and proved successful on the lighter soils of the uplands as well as on the heavier loam in the valley.

As it is desirable to save as much of the seed of these grasses as possible for use on the several experimental farms and for distribution to the farmers of the North-west, only small portions of the plots were cut green for ascertaining the yield ; the balance was allowed to ripen and some hundreds of pounds of seed have been obtained from them.

Yiled of native grasses and timothy.

Variety.	When sown.	In bloom.	Height.	Yield per acre.			
				Dry.		Green.	
			Inches.	Tons.	Lbs.	Tons.	Lbs.
Elymus Americanus	Spring 1891	July 20	48	3	1,200	7	600
Elymus Virginicus	do do	do 29	41	3	1,000	5	1,200
Agropyrum tenerum	do do	do 15	47	2	1,200	4	1,800
Muhlenbergia glomerata	do 1889	do 29	30	1	1,050		
Timothy	do 1890		30		1,025		
do	do 1891		41	1	720		

Fodder Corn.

This useful fodder plant has again given us a good return.

The field selected for this crop had a strong loamy soil and a southern exposure, the previous crop was barley, the stubble was ploughed in spring and harrowed a number of times, and a common wheat drill sowed the corn quite evenly in rows 3 feet apart and about 6 inches apart in the row. As soon as the grain was up a cultivator was run through the drills and all weeds kept down by this means through the summer, it will be seen by the accompanying table that many of the varieties gave a large return, but for this country only the early sorts should be sown.

The North Dakota Flint is one of the best for this locality, it ripens early gives a fair return of fodder, is short enough to cut with a binder and is very leafy.

Besides the plots for testing, 4 acres of the North Dakota variety was sown at the same time, and nearly all put into the farm silos ; the balance has been left in cone shaped stooks in the field and its value for food in the dry state will be tested during the winter.

Answers to the numerous enquires received regarding this crop may be summarized as follows :—

1. Select an early ripening variety.
2. A field having a southern exposure if possible.
3. Plough in spring and harrow often to start and kill weeds.
4. Sow under 30 lbs. seed per acre, price here $2 to $3 per bushel.
5. Sow with a wheat drill in rows 3 feet apart, grains 6 inches apart in the row, test your drill on a floor or hard road before sowing.

6. Start the cultivator as soon as the corn is above ground.
7. Keep all weeds killed during the growing season.
8. Cut before you commence wheat harvest or you may not spare time to cut it at all.
9. If you have no silo, stook in cone shape and fence from cattle, it will heat in a stack.

FODDER CORN.

Variety.	Tasselled.	Silk.	Early milk.	Late milk.	Stage when cut.	Height. ft. in.	Leafiness.	Average No. Stools.	Yield per acre, green. Tons. Lbs.
Rural Thoroughbred White Flint	Aug 15	Aug 23	......	......	Silk.	8	Very leafy	6	27 1,000
Red Cob Ensilage	do 23	......	......	......	Tasselled..	9	Few leaves	2	26 800
Mammoth Southern Sweet	do 30	......	......	......	Tassel. ...	9 6	Very leafy	4	26 140
White Flint	do 11	Aug 22	Aug 31	......	Early milk	8 9	Leafy	5	23 200
Pearce's Prolific	do 4	do 14	do 31	......	do	8 9	do	6	22
Longfellow	do 5	do 15	do 31	......	do	9	do	4	20 1,800
Smut Nose Flint	do 4	do 15	do 23	......	do	8 9	do	5	20 1,800
Cinquantine	do 4	do 12	do 20	......	do	7	Not leafy.	2	20 1,800
Rustler	do 4	do 15	do 31	......	do	10	Few leaves	1	20 1,140
Angel of Midnight	do 4	do 15	do 20	......	do	8 6	Very leafy	4	20 1,140
Pride of the North	do 11	do 17	do 25	......	do	8	Leafy	3	19 940
Northern Dakota	do 3	do 14	do 20	Aug 31	Late milk.	8	Very leafy	7	19 940
Crosby's Early Sugar	do 11	do 17	do 25		Early milk	7	do	6	17 1,200
Dakota Gold Coin	do 2	do 12	do 22	do 31	do	9	Leafy	2	17 1,200
Mitchell's Extra Early Flint	July 29	do 9	do 15	do 23	Late milk.	6	Very leafy	6	17 1,200
Dakota Dent	Aug 1	do 15	do 24	......	Early milk	10	Leafy	2	14 600
Ride out	do 6	do 15	do 30	......	do	8	do	5	12 200

MILLETS.

The seed of a very fine collection of millets was received from the Central Experimental Farm and they were sown on the 8th June in adjoining plots with a Planet Junior seed drill in rows one foot apart: they were kept free from weeds during the season of growth and all produced a heavy crop running from 48 to 75 inches in height and thick on the ground.

The accompanying table gives full particulars regarding each of these varieties.

As the bulk of the crop was required for exhibition purposes the area cut green was too small to permit of giving the yield per acre.

The following are among the most promising of the newly introduced varieties, Red Millet, a red seeded branching millet. Chana and Branching Millet are both very tall and branchy, but the Chana is fully a month later in coming in head. Choice Round White millet is a white seeded branching millet.

All the varieties formed seed here except the Chana and Italian millet, but the seed has not yet been tested for vitality and may not have fully matured.

As the question of suitable hay and fodder plants is so important for this province, I would suggest that larger quantities of seed of the more promising sorts be procured for test next season.

Millets.

Thirteen varieties were sown on 8th June in rows one foot apart with a planet junior drill, soil black loam, not manured, size of plots 5 x 13 feet.

Variety.	In Head.	Ripe.	Height.	Yield per Plot.	
				Dry.	Green.
			Inches.	Lbs.	Lbs.
Branching Millet	July 24	Sept. 9	75	27	70
Hungarian Grass	do 31	do 10	51	24	65
Italian Millet	Aug. 30	did not ripen	40	23	75
Common Millet	July 31	Sept. 5	50	22	50
Red Millet	Aug. 2	do 2	61	21	60
Hungarian and Millet mixed	July 31	do 10	51	21	55
Chana from Kulu, India	Aug. 24	did not ripen	68	20	55
Choice Round White Millet	do 2	Sept. 2	64	20	50
Round White Millet	do 2	do 2	63	19	50
Long headed Millet or Golden Wonder	do 22	do 10	44	18	55
California Green Millet	July 31	do 5	50	17	55
Manitoba Millet	do 31	do 3	57	17	45
Black Millet	do 30	do 1	54	16	40

Silos.

The two silos gave good satisfaction last season, and have been again filled this year, fodder corn has been almost exclusively used for this purpose, the corn used was the North Dakota variety cut with a Massey Binder when in the early milk stage, it was allowed to wilt two days then cut into one inch lengths with a Watson cutting box and conveyed at once into the silos.

The ensilage from this year's well matured and wilted corn is found to be sweeter and every way better than that made last year from immature and unwilted corn.

A small quantity of green oats was also cut and put into the silo, but it does not make as good ensilage as corn and the yield per acre is much less.

Field Roots.

The past season has been favourable for a large yield of all kinds of field roots, and the soil selected on the farm for the purpose being uniform, the experiment may be considered a fair test of varieties.

No manure was used with any of the roots, and the land received but one ploughing in spring, followed by several harrowings.

It is evident from the good returns which have been obtained with roots since this farm was established that there should be no scarcity of succulent food in this province during the winter for all kinds of stock, and if farmers would engage more extensively in mixed farming, it would tend to remove a large amount of the anxiety felt in the fall months regarding frost.

The Purple Top Swede has again given the largest yield, and the best shaped roots, and this variety can with safety be recommended for general cultivation here.

The yield per acre has been calculated from the results obtained from three rows of each variety of roots, one chain long.

Result of Experiments with Turnips during 1892.

Turnips were sown in flat drills 2½ feet apart. The land was in fodder corn the previous year. Two sowings were made, one on the 30th May and one on 6th June; taken up 21st October.

Variety.	Yield from Plots sown 30th May.			Yield from Plots sown 6th June.		
	Yield per Acre.			Yield per Acre.		
	Bush.	Tons.	Lbs.	Bush.	Tons.	Lbs.
Rennie's Prize Purple Top (Rennie)	1,019	30	1,140	655	19	1,300
Hazard's Improved	908	27	480	572	17	320
Sutton's Champion (Pearce)	852	25	1,120	673	20	380
Mammoth Purple Top (Evans)	833	24	1,980	704	21	240
Carter's Prize Winner (Pearce)	816	24	960	836	25	160
Selected Purple Top (Steele)	809	24	540	792	23	1,520
Bangholm's Improved Purple Top (Rennie)	752	22	1,120	638	19	280
Jumbo or Monarch (Steele)	733	21	1,980	704	21	240
Carter's Elephant Swede (Bruce)	695	20	1,700	660	19	1,600
Marquis of Lorne's Purple Top (Bruce)	675	20	500	528	15	1,680
Hartley's Bronze Top (Pearce)	655	19	1,300	629	18	1,740
Rennie's Elephant or Giant King (Rennie)	617	18	1,020	565	16	1,900
Bronze Top Extra (Evans)	488	14	1,280	660	19	1,600
Novelty No. 1 (Rennie)	......	......	......	884	26	1,040

Yield of Mangels and Sugar Beets.

The seed was sown in flat drills 2½ feet apart, two sowings were made, one on May 30th and one on June 6th, the roots were pulled October 15th, the land was in fodder corn the previous year.

Variety.	Sown 30th May.			Sown 6th June.		
	Yield per Acre.			Yield per Acre.		
	Bush.	Tons.	Lbs.	Bush.	Tons.	Lbs.
Gate Post or Long Red (Bruce)	1,460	43	1,600	1,157	34	1,420
Mammoth Long Red (Steele)	1,302	39	120	1,205	36	300
Pearce's Canadian Giant (Pearce)	1,245	37	700	976	29	560
New Giant Yellow Intermediate (Steele)	1,232	36	1,920	Destroyed by cut worm.		
Red Globe (Bruce)	1,069	32	140	829	25	1,480
Carter's Warden Prize Yellow Globe (Pearce)	1,056	31	1,360	902	27	120
Berkshire Prize (Evans)	985	29	1,100	866	25	1,960
Rennie's Mammoth Long Red (Rennie)	985	29	1,100	1,064	31	1,840
Yellow Globe (select) (Steele)	941	28	460	778	23	680
Golden Fleshed Tankard (Steele)	910	27	600	805	24	300
Red Globe Oberndorf Extra (Evans)	862	25	1,720	866	25	960
Red Fleshed Tankard (Bruce)	796	23	1,760	809	24	540
Klein Wanzleben (Vilmorin)	629	18	1,740			
Vilmorin's Improved (Vilmorin)	616	18	960			
Kruger's seed	554	16	1,240			
Brabant (Vilmorin)	429	12	1,740			

Results of Tests with Carrots.

The seed was sown in flat drills $1\frac{1}{2}$ feet apart; two sowings were made, one on 30th May and one on 6th June; harvested 18th October. This land was in fodder-corn the previous year.

Variety.	Sown 30th May. Yield per Acre.			Sown 6th June. Yield per Acre.		
	Bush.	Tons.	Lbs.	Bush.	Tons.	Lbs.
Carter's Orange Giant (Pearce)	462	13	1,720	283	8	980
Iverson's White (Ewing)	462	13	1,720	288	8	1,280
Mammoth Smooth White (Bruce)	452	13	1,120	418	12	1,080
Improved Short White (Steele)	422	12	1,320	464	13	1,840
Chantenay (Rennie)	408	12	480	259	7	1,540
Mammoth White Intermediate (Rennie)	403	12	180	403	12	180
Giant Short White Vosges (Simmers)	356	10	1,360	308	9	480
Early Gem (Rennie)	337	10	220	349	10	940
Guerande, or Ox Heart (Steele)	334	10	40	344	10	640
Rennie's Improved Half Long White (Rennie)	330	9	1,800	457	13	1,420
Giant White Belgian (Steele)	317	9	1,020	317	9	1,020
Danver's Orange (Steele)	310	9	600	290	8	1,400

Potatoes.

The past season has been an excellent one for potatoes, and both yield and quality are all that could be desired.

One hundred varieties were tested on this farm, and the following tables contain particulars regarding yield, earliness, &c., of seventy-six of the best of them.

Early Gem and Lizzie's Pride, two of the varieties introduced from the east this year, are most promising, being productive and of good quality.

The first twenty-two varieties are from seed sent from the Central Experimental Farm, and are being grown on uniform plots on all the experimental farms. Among them are many excellent sorts, but some of them are too late for this province.

It is probable that the production of potato starch could be undertaken with profit in this country. In some of the eastern provinces, where the yield of potatoes does not average more than one-half of that obtained in this country, the production of starch is found profitable for both farmer and manufacturer.

Experiments with Potatoes.

Results obtained from twenty-two varieties of potatoes grown from seed originally obtained from the Central Experimental Farm, Ottawa, planted May 27th in rows three feet apart, the cuttings placed one foot apart in the row ; all were dug on Oct. 1st ; the yields are calculated from the produce of one row, one chain long, no manure was used, and the previous crop was fodder corn.

Variety.	Yield per Acre.	Earliness.	Quality when Cooked.		Growth of Plant.	Size.
			Dryness	Flavour		
	Bush.					
Clarke's No. 1	414	Very early	Dry	Good	Strong	Large.
White Star	385	Late	Fair	Fair	do	Medium.
Early Puritan	374	Medium early.	Dry	Good	do	Large.
Halton Seedling	363	Very early	do	Fair	Medium	do
Empire State	352	Late	do	Good	Very strong	Medium.
Delaware	348	do	Fair	do	do	Large.
Early Eating	348	Very early	Dry	do	Medium	Medium.
Early Maine	344	Medium early.	do	do	do	do
Early Rose	332	do	do	do	do	do
Rose's New Giant	322	Very late	Wet	Poor	Strong	Large.
Thorburn	304	Medium early.	Dry	Good	Medium	Medium.
Rural New Yorker, No. 2	282	Very late	do	do	Strong	Large.
Lee's Favourite	278	Very early	do	do	Weak	do
Chicago Market	264	Late	do	do	Medium	Very large.
May Queen Early	260	Medium early.	do	do	do	Small.
Vanguard	256	Early	Fair	Fair	do	Large.
London	256	Medium early.	Dry	Good	do	do
Rural Blush	245	do	do	do	Strong	do
Ohio Gunner	238	Very early	do	do	Below medium	do
Early Ohio	231	do	Fair	do	do	Medium.
Algoma, No. 1	223	do	Dry	do	Medium	Large.
Beauty of Hebron	161	Medium early.	do	do	Below medium	do

Particulars of fifty-four varieties of potatoes, mostly selections from varieties grown on this farm in previous years, with some additional ones procured this year. Those marked C. E. F. are seedlings originated on the Central Experimental Farm. The date and manner of planting of this collection was the same as that last mentioned; the soil in each case was a rich black loam.

Variety.	Yield per Acre.	Earliness.	Quality when Cooked.		Growth of Plant.	Size.
			Dryness	Flavor.		
	Bush.					
Early Gem	443	Medium early.	Ex. dry.	Good	Medium	Large.
Early Fortune	421	do	Fair	Fair	Very strong	do
Lizzie's Pride	396	Late	Dry	Good	Strong	do
Munro County	370	do	Fair	do	do	do
C. E. F., No. 80	359	Very late	do	Fair	do	do
New Badger State	359	do	Dry	Good	Very strong	do
Snow Flake	352	Medium early.	do	do	Medium	do
C. E. F., No. 9	348	do	do	do	Strong	Medium.
Jackson's Improved	348	Very late	Wet	Poor	Very strong	Small.
Alpha Small	348	Medium early.	Dry	Good	Strong	Large.
C. E. F., No. 116	344	Very late	Wet	Poor	do	Small.
Wonder of the World	341	Medium early.	Dry	Good	Medium	Large.
C. E. F., No. 21	341	Late	Fair	do	Strong	Medium.
Brownell's Best	337	do	Dry	do	Medium	Large.
Richter's Schneerose	330	Very late	Wet	Fair	Very strong	do
Genesee Seedling	315	Medium early.	Fair	do	Strong	do
Rosy Morn	311	do			Medium	do
Richter's Imperator	297	Very late	Fair	Good	Very strong	do
Sunrise	293	Early	Dry	do	Medium	do
Crown Jewel	293	Medium early.	do	do	do	do
C. E. F., No 54	293	Late	Fair	Medium	do	Medium.
Snowdrop	282	Medium early.	Dry	Fair	do	Large.
Jumbo	278	Late	Fair	do	do	do
Stray Beauty	267	Early	Dry	Good	do	Medium.
Lady Finger	264	Very late	Wet	Poor	Very strong	do
Main Crop	260	do	Dry	Fair	do	Large.
British Magnum Bonum	256	do	Wet	Poor	do	Medium.
Thorburn's Paragon	256	Medium early.	Dry	Good	Medium	Large.
C. E. F., No. 120	253	Late	Wet	Poor	do	Medium.
Steele's Earliest of All	253	Medium early.	Dry	Good	do	Large.
Thorburn's Late Rose	249	Late	do	do	Strong	do
St. Patrick	245	do	Wet	Poor	Weak	do
Lady Fife	242	do	Dry	Good	Strong	Small.
C. E. F., No. 209	238	do	Fair	Fair	do	Medium.
do 188	238	Medium early.	Dry	Good	Medium	do
Ammon's Early	238	Early	Dry	Good	Weak	Medium.
C. E. F., No. 120	234	Late			Medium	do
Forty Fold	227	Very late	Fair	Fair	do	do
Shah	223	Late	Dry	Poor	Very strong	Large.
Taylor's Prolific	220	Medium early.	do	Good	Weak	do
C. E. F., No. 5	220	Very late	Wet	Poor	Strong	Medium.
Bruce	220	do	do	do	Very strong	do
Rocks	216	do	do	do	Strong	do
C. E. F., No. 141	216	Medium early.	Fair	Fair	Medium	do
Pride of America	216	do	do	do	do	Large.
C. E. F., No. 95	201	Late	do	Good	do	Small.
do 94	201	Very late	Wet	Poor	Strong	do
do 27	187	Late	Dry	Good	Very strong	Medium.
Toronto Queen	165	Medium early.	do	do	Medium	Large.
C. E. F., No 231	161	Late	Wet	Poor	Strong	Small.
Mayatt's Ash Leaf Kidney	139	do	do	do	Weak	Medium.
Leather Hide	135	do	Fair	do	do	do
Village Blacksmith	128	do	do	Fair	Strong	do
Cream of the Valley	117	do	Wet	Poor	do	do

Cattle.

The 15 head consisting of four breeds of cattle imported from Ontario last fall, have all kept in good health, and there has been added to the herd the following calves: one Durham, two Ayrshires, two Holsteins, two Galloways and one Grade.

For future reference an exact record is kept of the yield of milk from each cow of the dairy breeds.

The bulls of the several breeds are well patronized by neighbouring farmers, no less than 71 cows having been served during the year. A charge of two dollars is made, payable at time of service; no difficulty is found in collecting the charges, and farmers appreciate the advantage of having good stock in their neighbourhood.

Feeding Steers on Frozen Wheat and Barley.

The large amount of feed grain in the hands of our farmers during the past year, coupled with the low prices prevailing, makes the question of its feeding value an important one.

With the object of throwing some light on this question, the feeding of a limited number of steers was undertaken last winter on this farm.

The conditions surrounding farmers here are somewhat as follows:—

Many are short of hay but have abundance of clean bright straw and chaff, and are either unwilling or lack the necessary help to grow root crops, but have generally a good supply of coarse grain or damaged wheat.

To meet these conditions the experiments in connection with steers were undertaken with a view of determining the following points:—

1st. If steers can be fattened to advantage on frozen wheat and cut straw without roots or ensilage.

2nd. What advantage, if any, would accrue from the addition of a limited quantity of roots to this ration.

3rd. Can steers be successfully fattened on a ration of barley and straw, combined with a very limited quantity of hay and roots.

The six steers used for this test were apparently Shorthorn grades, two years old, and were raised by farmers in this neighbourhood; they cost $2\frac{3}{4}$ cents per pound and sold for 4 cents per pound, live weight.

They were divided into three lots of two steers each, and fed for four and a-half months all they would eat clean of the following ration:—

First lot of steers—

	Lbs.
Cut wheat straw	20
No. 3 frozen wheat chop	16

Second lot of steers—

	Lbs.
No. 3 frozen wheat chop	10
Turnips	20
Cut wheat straw	15

Third lot of steers—

	Lbs.
Barley chop	11
Turnips	20
Native hay	6
Cut wheat straw	10

The several ingredients were spread in layers in a heap, and after being moistened were thoroughly mixed and fed the following day, in three feeds.

Feed Consumed.

The total amount and cost of feed consumed during the feeding period (132 days) was as follows :—

First lot of steers—

3,320 pounds cut straw	
2,568 " wheat chop at $\frac{1}{2}$ cent per pound	$12 84

Second lot of steers—

2,865 pounds cut straw	
1,799 " wheat chop at $\frac{1}{2}$ cent per pound	$ 8 99
63 bushels turnips at 5 cents per bushel	3 15
	$12 14

Third lot of steers—

2,270 pounds cut straw	
2,382 " barley chop at $\frac{1}{2}$ cent per pound	$11 91
75 bushels turnips at 5 cents per bushel	3 75
1,320 pounds hay at $5.00 per ton	3 30
	$18 96

Lot No. 1 were "off their feed" several times, and it was quite evident that for the best results some succulent feed should be used, still if this cannot be had, we have proved that it is possible to fatten steers even on frozen wheat and straw alone.

The other two lots were always ready for their feed and their rations were evidently better relished.

Summary of Results.	First cost of Steers.	Cost of Feed.	Price sold for.	Profit.	Daily gain of each Steer.
	$ cts.	$ cts.	$ cts.	$ cts.	
First lot of Steers	49 63	12 84	86 80	24 33	$1\frac{3}{10}$
Second lot of Steers	48 95	12 14	82 60	21 51	$1\frac{7}{100}$
Third lot of Steers	48 80	18 96	91 80	34 06	$1\frac{9}{10}$

The return from the frozen wheat chop fed to lot 1 was equal to 56c. per bushel, while the return from the same wheat fed to lot 2, after deducting the cost of turnips, was equal to 61c. per bushel. The same grade of wheat was selling at 30c. last winter, and is almost unsaleable at any price at this date.

Conclusions.

1st. Although not the most economical way of feeding grain, chop fed frozen wheat mixed with straw alone gave a return of 56c. per bushel, not counting cost of labour.

2nd. If turnips are added to the above ration, they not only pay their cost price but greatly increase the feeding value of the other ingredients.

3rd. Barley chop and wheat straw fed in connection with even a limited quantity of turnips and hay makes an excellent ration, and barley is a grain that we can raise in almost unlimited quantities without risk of injury from frost.

Apple Trees.

Last fall all apple trees were protected either by wrapping with tar paper or canvas and the covering allowed to remain until some time in the following May.

The past winter was an unusually severe one; this coupled with the almost total absence of snow in this portion of the province made it particularly trying on all fruit trees, fourteen varieties were completely killed out and a large proportion of other varieties either killed outright or cut to the ground.

There are, however, a few varieties that came through the winter with little or no injury, the most promising of these are Antonovka, Summer Arabka, Anis, Red Anis and Pointed Pipka; these varieties are so free of injury that I would suggest that additional trees of these sorts be secured for filling vacancies in the fruit plots.

I regret to have to report the almost total loss of the fifty seedling apple trees from imported Russian apple seed. This plot was bare of snow all winter and the trees being too small to protect by the usual methods, nearly all were killed.

The remaining apple trees were well protected with tar paper, &c., this autumn, and as the snow-fall came early and is already quite heavy we may reasonably expect a more favourable season.

Apple Trees formerly tall standards, now grown in bush form.

Variety.	Number of Trees Living. 1891.	1892.	Present Condition.	Present Height. Inch.	Season's Growth.
Antonovka	5	5	Good	46	24 inches; hardy growth.
Arabka, summer	2	2	Very good	62	15 do extra hardy growth.
do winter	2	2	Fair	36	15 do hardy growth.
Anis	2	2	Good	40	12 do do
do red	1	1	do	36	15 do do
do mottled	1	1	Fair	42	15 do do
Aport	4	3	Good	40	24 do hardy.
Alexander	4	2	Fair	43	32 do do
Blue Pearmain	1	0			
Ben Davis	3	3	Good	36	16 do do
Borovinka	2	2	do	21	8 do do
Canada Baldwin	3	2	Fair	59	22 do doubtful.
Duchess of Oldenburg	4	4	do	42	16 do do
Fameuse	3	3	do	33	17 do do
Gipsey Girl	3	3	Good	57	7 do hardy growth.
Grand Duke Constantine	1	1	do	56	25 do do
Golden White	2	1	do	53	27 do do
German Calville	1	1	Fair	43	33 do doubtful.
Golden Russet	2	1	do	45	33 do kills back.
Grimes' Golden	1	1	do	43	23 do do
Hibernal	4	3	Good	36	15 do hardy growth.
Herren	1	0			
Haas	1	1	Good	58	30 do do
Enormous	1	0			
Bogdanoffs' Glass	1	1	Fair	32	2 do kills back.
Kellogg Russet	1	0			
Lead	2	0			
Livland Raspberry	1	1	Good	43	30 do do
Longfield	4	3	Fair	23	23 do killed to ground, winter 1891-2.
Mann	1	1	Poor	9	9 do do do
McIntosh Red	2	2	do	54	17 do hardy growth.
Pointed Pipka	2	2	Very good	61	21 do extra hardy growth.
Peach	2	2	Fair	42	32 do kills back.
Red Bietigheimer	1	0			

APPLE Trees, formerly tall standards, now grown in bush form—*Concluded.*

Variety.	Number of Trees Living.		Present Condition.	Present Height.	Season's Growth.
	1891.	1892.		Ins.	
Red Astrachan	2	2	Fair	33	14 inches; kills back.
Steklianka	2	2	Good	48	18 do do
Serinkia	1	1	do	46	24 do hardy growth.
Scott's Winter	1	1	do	44	15 do kills back.
Switzer	2	2	Fair	63	23 do do
Stettin Yellow	1	1	Poor	36	17 do do
Shaker Pippin	2	2	Fair	44	14 do do
Tetofsky	3	3	Good	43	11 do hardy growth.
Titovka	2	2	do	36	16 do do
Talman's Sweet	1	0	....	....	
Ukraine	2	0	....	....	
Vargul	1	1	Good	28	18 do do
White Borodovka	1	1	do	35	14 do do
Winter St. Lawrence	2	2	Very good	63	23 do do
Wallbridge	1	0	....	....	
Wealthy	2	2	Good	62	22 do do
Yellow Transparent	2	1	Poor	28	22 do kills back.

APPLE Trees growing in bush form, on low stems.

Variety.	Number of Trees Living.		Present Condition.	Present Height.	Season's Growth.
	1891.	1892.		Ins.	
Anisim	4	4	Good	34	14 inches; hardy growth.
Autumn Streaked	5	3	do	25	15 do extra good.
Broad Green	2	2	Extra good	35	14 do hardy growth.
Blushed Calville	3	3	do	25	15 do do
Christmas	2	0	....	....	
Cross	2	1	Fair	48	24 do do
Crooked Spice	1	0	....	....	
Duchess of Oldenburg	10	9	Good	40	16 do extra hardy growth.
Grandmother	8	7	do	49	18 do do
Krimskoe	1	1	Poor	29	9 do tender growth.
Koursk Anis	3	1	Fair	25	12 do do
Koursk Reinette	1	1	Good	38	18 do hardy.
Karabovka	1	1	Fair	24	11 do doubtful.
Kruder	1	1	do	23	12 do do
Kremer's Glass	1	1	do	30	14 do do
Lejanka, or Liebig	13	12	Extra good	50	22 do very hardy growth.
Osimoe	1	1	Good	40	10 do hardy growth.
Orel, No. 5	1	1	do	45	17 do do
Orel, No. 11	1	1	....	39	25 do do
Ostrokoff's Glass	3	0	....	....	
Pineapple	3	3	Fair	42	13 do hardy.
Plikanoff	9	9	Good	26	15 do hardy.
Repolovka	2	2	Fair	31	10 do hardy growth.
Russian Green	1	0	....	....	
Red Repka	4	3	Very good	60	22 do extra hardy.
Romna	6	5	Good	40	9 do hardy growth.
Red Anis	14	14	do	45	21 do do
Sandy Glass	1	1	Poor	28	28 do killed to ground, winter, 1891.
Sugar Sweet	2	1	do	21	8 do doubtful hardy.
Silken	4	4	Good	43	23 do hardy growth.
Simbirsk, No. 1	2	2	do	49	18 do do
do No. 2	1	1	do	45	13 do do
do No. 9	2	2	do	21	13 do do
Tashkin	2	2	do	36	16 do do

APPLE Trees growing in bush form on low stems—*Continued.*

Variety.	Number of Trees Living.		Present Condition.	Present Height.	Season's Growth.
	1891.	1892.		Inch.	
Tiesenhausen	1	1	Very good	42	19 inches; hardy growth.
Titovka	8	6	do	43	18 do extra hardy growth.
Ukraine	3	2	Good	45	15 do hardy growth.
Vargulek	3	2	do	43	16 do do
White Pigeon	1	1	Poor	12	12 do killed to ground, winter, 1891.
Yellow Arcadian	2	1	Fair	21	19 do doubtful.
Yellow Anis	9	9	Good	38	24 do extra good.
Yellow Sweet	1	0	....	......	
Zusoff	2	2	....	42	19 do

CRAB APPLE TREES.

The experience with apples here generally has not been promising, and I am the more pleased to be able to report a fair amount of success with the hardy varieties of Crab Apples.

Five varieties survived the past severe winter uninjured, and the Transcendant, for the first time, bore a small amount of fruit.

The fruit of this variety would find ready sale here if it is found to grow successfully.

Variety.	Number of Trees. Living.		Present Condition.	Present Height.	Season's Growth.
	1891.	1892.		Inch.	
Transcendant	9	9	Extra good	72	27 inches; extra hardy, fruited.
Whitney's No. 20	3	3	do	65	20 do extra hardy.
Hyslop	7	7	Good	58	25 do hardy.
Orange	2	1	Fair	59	18 do kills back.
Early Strawberry	2	2	do	40	47 do do
Queen's Choice	1	1	Poor	33	33 do killed to ground, winter of 1891 and 1892.
Lou's Favorite	1	0	....	......	
Martha	1	0	....	......	

Plums.

Of the eleven varieties of plums remaining in the fall of 1891, four varieties have been killed completely and two others have been cut to the snow line, the De Soto, Early Red, Nicholas and Native will probably prove hardy, the balance will, no doubt, succumb this winter. I am told that the fruit of the native plum varies greatly and that some of it is of excellent quality; if this is found to be the case, a selection should be made and a number of trees propagated from the...

Variety.	Number of Trees Living.		Present Condition.	Present Height.	Season's Growth.
	1891.	1892.		Inch.	
Bradshaw	2	2	Fair	50	34 inches; kills back.
Coe's Golden Drop	1	0			
De Soto	2	2	Good	36	12 do hardy growth.
Early Red	7	7	do	42	32 do do
Late Red	1	1	Poor	14	12 do growing from roots.
Marianna	2	0			
Moore's Arctic	1	0			
Nicholas	3	3	Good	69	34 do extra hardy.
Otschakoff	2	2	do	33	30 do killed to snow line.
Trabische	1	0			
Native wild Plum	7	7	Good	72	19 do good.

Cherries.

The few surviving varieties of cherries have done fairly well when the severity of of the past winter is considered, the 6 m and Koslov Bush Morello are quite promising.

Variety.	Number of Trees Living.		Present Condition.	Present Height.	Season's Growth.
	1891.	1892.		Inch.	
Bassarabian	2	1	Fair	17	15 inches; hardy growth.
Lutovka	5	4	Good	36	14 do do
6 m Cherry	2	2	do	57	18 do do
12 m do	1	0			
Koslov Bush Morello	4	4		23	16 do hardy.

SMALL FRUITS.

Although the success of most large fruits in this country is doubtful, we have the satisfaction of knowing that nearly all small fruits are hardy, free from insect enemies, and, if properly attended to, very productive. All cultivated small fruits bore abundantly this year, and the current bushes, although young, were loaded with large fruit, and the same may be said of the hardy raspberries and Houghton gooseberries.

Currants.

Particulars of the currants have been arranged in tabular form as follows:

Variety.	Colour.	Size.	Flavor.	Yield of 10 bushes.
				Lbs.
Lee's Prolific	Black	Very large	Excellent	33
Champion	do	Large	Poor	13
Naples	do	Very large	Good	12
Native, large variety	Brown-black	Medium to large.	Strong	
Native, small variety	Jet black	Small	Bitter	8
Raby Castle	Red	do	Good	18
Fay's Prolific	do	Large	do	12½
Victoria	do	do	do	14
Cherry	do	do	do	10
White Grape	White	Very large	Choice	12

Gooseberries.

The Houghton has again proved to be the best variety tested on this farm, it is perfectly hardy and bore well this year; the fruit is however quite small.

Downing has been nearly all winter-killed and is much too tender for this country.

Smith's Improved is fairly hardy, bears large-sized fruit, but is not very productive here.

Native is of course hardy, but the fruit is small and very prickly.

Raspberries.

The following list includes the most promising varieties tried on this farm:—

Turner, a red variety, medium in size, rather soft for shipping, but excellent for home use, quite hardy and with us not benefited by winter protection; rows thinned to hills three feet apart gave larger yield than if left unthinned.

Philadelphia, dark red, medium to small, very prolific, extra hardy here.

Cuthbert, red, large, excellent flavor, not quite as hardy as the two preceeding varieties, but fruit of better quality.

Marlboro, red, extra large, fine flavor, prolific, hardy.

Caroline, yellow, flavor good, rank grower, late, requires protection here.

Forest Trees and Shrubs.

Hardiness of new varieties of forest trees and shrubs received in 1891.

Mention was made in my last report of having received from the east during 1891 a number of trees and shrubs, many of them new to this farm; below will be found full particulars of the hardiness and growth of these.

Variety.	Planted, 1891.	Alive, 1892.	Season's growth, 1892.
Pyrus Aucuparia	50	46	24 inches; hardy.
Pyrus Americana	59	59	36 do do
Alder American	6	2	18 do do
Maple, hard	168	46	6 do half hardy.
Oak (Macrocarpa)	10	4	Small.
Spruce, Black Hill	5	5	do
Red Pine	10	....	Too tender.
Beech	6	....	do
Caragana Frutescens	7	4	12 inches; hardy growth.
Berberis Thunbergii	4	4	Small; kills back.
Spiraea	4	....	
do Californica	5	2	Small; hardiness doubtful.
Ampelopsis Quinquefolia or (American Ivy)	13	10	15 inches; hardy growth.
Honeysuckle, Tartarian red	4	2	Small; hardiness doubtful.
do do black	7	5	do do
Syringa Japonica	5	....	

An additional supply of fruit and forest trees, shrubs, roses, &c., were received last fall and spring. These will be reported on after passing the ordeal of a winter here.

AVENUES.

The Ash-leaf Maple avenues on the farm have thriven exceedingly well, only one tree having died during the year; their growth has been large, and they have preserved a uniform shape with but very little attention. I feel confident that we have excellent material for avenues in this easily obtained tree.

Two of the Ash-leaf Maple trees were attacked shortly after coming into leaf by a light green caterpillar which fed on the tender leaves; the trees were at once sprayed with Paris green and water in the proportion of about a teaspoonful of the Paris green to one part of water. This effectually destroyed the pest.

The avenue on the eastern boundary composed of Ontario White Elm, planted three years ago, has killed down every winter, and last spring Russian Poplars were planted between them; these have nearly all lived and made good growth.

The Native Spruce in the avenues are all living, and are quite ornamental.

The shelter belts on the west side of the farm have made a large growth, and already afford some protection to the farm.

EXPERIMENTS WITH TREES AS WIND-BREAKS.

On the treeless prairies of this province the question of wind-breaks is an important one, and it was with pleasure that I received your instructions to devote a number of suitable plots of ground to this purpose.

In the spring of 1891 twelve plots were set apart, and a number of hardy varieties of trees planted for wind-breaks.

As the native Ash-leaf Maple is the most readily obtained tree in most parts of this country, eight plots were devoted entirely to this variety, and for the purpose of ascertaining how far the influence of the shelter will extend, the plots were made of varying widths, and the trees set at different distances apart.

The remaining plots were devoted to a test of other hardy trees for this purpose, set at such distances as were thought to be most suitable for the variety.

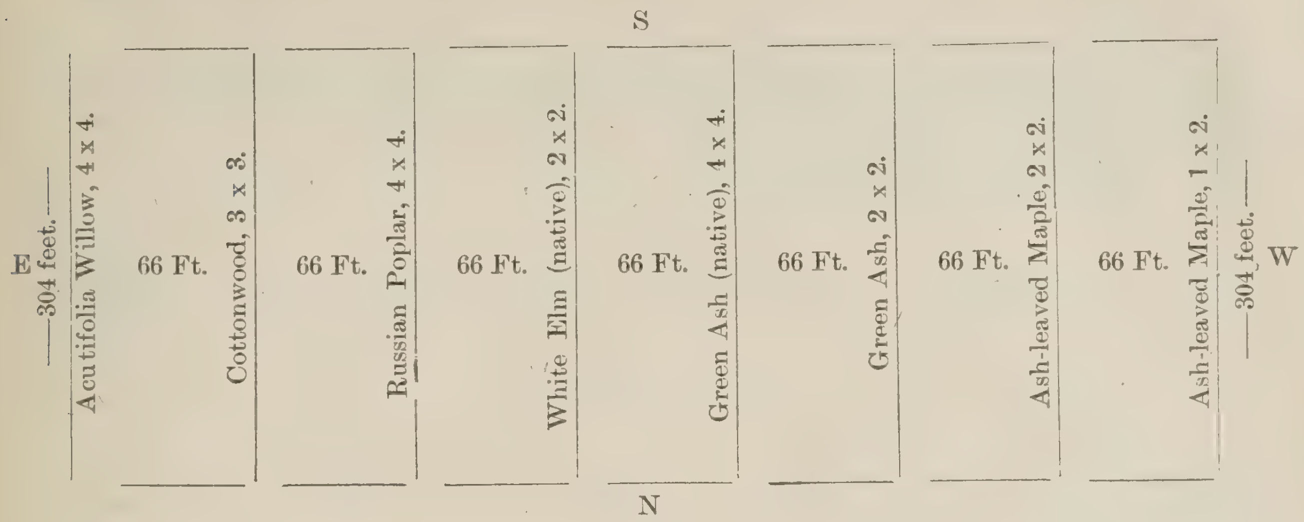
So far the Russian Poplar *(Populus bereolensis)* has made the most growth, and it is already an effective wind-break.

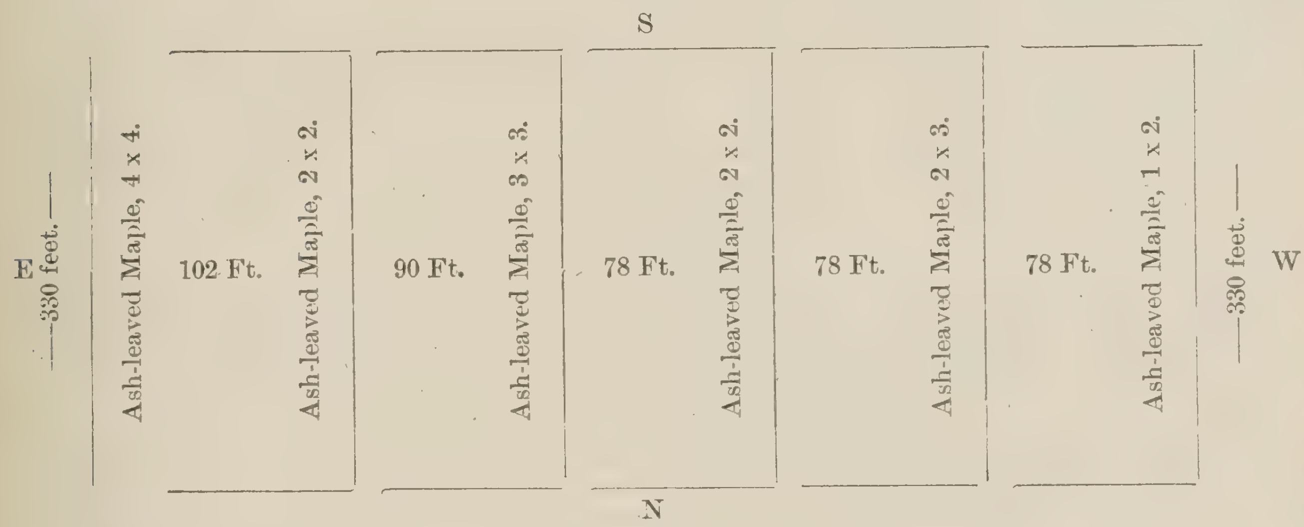
Following this will be found full particulars of these hedges, and the progress they have made to date.

TREES AS WINDBREAKS.

Variety.	Size of Plot in Feet.	Distance apart of Trees.	Average Season's Growth.	Average Height.	Remarks.
			Inches.	Inches.	
Ash-leaf Maple...........	78×330	1×2	26	48	Healthy growth.
do	78×330	2×3	30	53	Appears to have done the best.
do	78×330	2×2	31	57	Healthy growth.
do	90×330	3×3	22	43	Low spot; damaged by water.
do	102×330	2×2	30	58	Healthy.
do	304×66	4×4	15	39	Low spot; damaged by water.
do	304×66	1×2	14	36	Light growth; very much exposed to wind.
do	304×66	2×2	10	38	do do
Native Green Ash...........	304×66	2×2	8	22	Slow growth at first.
do	304×66	4×4	8	22	do
Native White Elm..........	304×66	2×2	17	29	Very healthy.
Russian Poplar (bereolensis) .	304×66	4×4	31	68	Excellent; already a good wind break.
Cottonwood.................	304×66	3×3	30	....	Thin; from cuttings that did not strike well.
Willow (Salix acutifolia).....	304×66	4×4	28	63	Very healthy and even growth.

PLAN showing arrangement of Shelter Belts; the openings, leading into and out of each plot are 12 feet wide, otherwise the plots are entirely surrounded by the wind break.





TREE DISTRIBUTION.

The distribution of hardy forest tree seedlings and cuttings from this farm has largely increased during the past year, over fifty thousand were applied for, as this number exceeded our supply, applications for ten thousand were held over and will be filled next spring.

Many favourable reports have been received from parties supplied with trees in 1890 and this branch of the farm work is greatly appreciated especially by farmers settled on the unsheltered prairies.

All the trees and cuttings sent out last year were grown on the Experimental Farm and over fifty thousand have been prepared for next spring's distribution.

The packages were sent by mail and contained one hundred trees and cuttings as follows:

Variety.	Number.	Variety.	Number.
Ash-leaf Maple	42 trees.	Willow Laurifolia	1 cuttings.
Nativé White Elm	6 do	Poplar bereolensis	7 do
Green Ash	1 do	do Petrovsky	8 do
White Birch	2 do	do certinensis	1 do
Artemisia abrotans	3 cuttings.	do alba argentea	1 do
Willow Voronesh	15 do	do Wobstii Riga	1 do
do acutifolia	2 do	Cottonwood	10 do

Vegetables

CORN FOR TABLE USE.

Ten early varieties of corn were sown in hills on adjoining plots, of these the Squaw corn is decidedly the earliest variety tried, but the flavour is poor and the ears short, the Cory, Pearce's Superior and Mitchell's Extra Early are good varieties, and will mature sufficiently for the table in an average season.

Variety.	When sown.	In tassel.	Fit for eating	Number of days maturing for table use.
				Days.
Squaw Corn (native)	May 30	July 22	August 17	79
Pearce's Superior	do 30	do 28	do 23	85
Early Cory	do 26	August 1	do 21	87
Stowell's Evergreen	do 30	do 6	do 27	89
Mitchell's extra early	do 26	do 1	do 27	93
Pop Corn	do 26	July 28	do 29	95
Marble head	do 26	August 4	do 29	95
Crosby's Early Sugar	do 30		Sept. 6	99
Perry's Hybrid	do 30		do 10	103

Garden Pease.

Nineteen varieties of garden pease were grown on the farm this year.

The Horsford market garden pea was one of the best of the early varieties, being early, productive and of good flavour.

The Telephone is an excellent late variety.

The accompanying table gives particulars of these varieties; all were sown on 11th May in rows three feet apart, the yield given is of ripe pease, the produce of one row 132 feet long:—

GARDEN PEASE.

Variety.	Earliness.	Flavor.	Size.	Colour.	Surface.	Yield from 132 feet.
						Lbs.
American Wonder	Extra early	Good	Medium	Blue	Wrinkled	7½
Blue Imperial	Early	do	Large	do	Smooth	12
Beck's Gem	do	do	Medium	White	do	9
Bliss' Abundance	do	do	Large	Blue	Wrinkled	12
Carter's First Crop	Extra early	do	Small	White	Smooth	11
Duke of Albany	Medium	Very good	Large	Blue	Wrinkled	8
Extra Early Star	Early	Fair	Small	White	Smooth	9
Extra Early Dwarf Brittany	Late	do	Medium	do	do	14
First and Best	Early	do	do	do	do	11½
Horsford's Market Garden	do	Good	Large	Blue	Wrinkled	13½
Kentish Invicta	Extra early	Fair	Small	do	Smooth	6
Laxton's Alpha	do	Good	Medium	do	Wrinkled	10½
Laxton's Supreme	Early	do	do	do	do	12
McLean's Blue Peter	do	Poor	Large	do	Smooth	8½
Pride	Medium	do	do	White	do	10½
Rennie's No. 10	Late	do	do	do	do	17
Steele Bros. Extra Early	Early	Fair	Small	do	do	6
Stratagem	Medium	Good	Large	Blue	Wrinkled	8
Telephone	Late	do	do	do	do	10

GARDEN BEANS.

Thirty-six varieties of garden beans were tested on the Experimental Farm this year.

All were sown on 31st May, with a garden drill, in rows three feet apart, very few varieties were fully ripe when cut down by frost on 10th September.

The following failed to ripen any seed whatever, Emperor William, California Sugar Bean, Scarlet Runners, New Bush Lima, New Golden Andalusian Wax, Red Speckled, Horticultural, Giant Red Wax and Cluster Wax.

Below will be found particulars of each variety arranged in the order of their maturing :—

GARDEN BEANS.

Variety.	Condition, time of first Frost.	When ripe.	Yield on 66 feet of Row. Lbs.	Oz.
Early Yellow, six weeks	Ripe	Sept. 5	2	2½
Dwarf German White Wax	do	do 5	1	1
Golden Wax	do	do 5	2	...
Large Yellow, six weeks	do	do 7	2	14
Early Dun-coloured	Nearly all ripe		4	3
Ne Plus Ultra	do		3	.....
Black-eyed Wax	do		.....	15
Sugar Grey	50 per cent ripe		3	6
Early China	50 do		2	9
Flageolet Wax	50 do		3	12
Dwarf German Black Wax	50 do		.....	9
Mammoth Red German Wax	50 do		1	1
Negro Extra Early	25 do		3	7
Crystal White Wax	Few ripe		1	6
Early Mohawk	do		3	4
Sugar Pearl Predome	do		3	4
Yosemite Mammoth Wax	do		1	.....
Black Speckled	Green		2	2
One hundred to one	do		2	3
Royal Dwarf Kidney	Very green		1	2
Black Long Podded	do		1	8
Canadian Wonder	do		1	4
Large Podded	do		3	....
Crown Horse Bean	Fully ripe ; 2 ft. 9 in. in height.		7	2

RHUBARB.

Owing to the great scarcity of cultivated fruit in this province, rhubarb, or pie plant, is valued more highly than in the Eastern Provinces, and large quantities are used.

Althought this plant is not supposed to come true from seed, it is more convenient to mail seed than roots, and it was thought advisable to ascertain whether good varieties could be obtained by this means ; seed from five varieties were sown in the open ground in the spring of 1891, and moved to permanent location the following spring, although this is only the second year from seed it will be seen that the returns are already large.

Many complaints are received from farmers that rhubarb has not succeeded with them, on examination it is found that the plants are either smothered with weeds, the soil impoverished or the plants have been growing too long in one spot.

The plants should be moved to a new location every four or five years, be kept free from weeds and heavily manured each year.

RHUBARB.

Variety.	Date of Sowing Seed.	Circumference of Stalk.	Weight per Hill.	
		Inches.	Lbs.	Oz.
Victoria	1891	$4\frac{3}{4}$	10	
Johnston St. Martin	1891	$4\frac{1}{2}$	7	6
Myatt's Linnaeus	1891	5	6	4
Stotts Mammoth	1891	5	4	4
Carleton Club	1891	4	3	3
Tottles Improved	From roots	$5\frac{1}{2}$	11	6

Farmers Institute Meetings.

During the past year the following Institute meetings were attended by invitation, and the papers mentioned read by me; in many cases samples of grain threshed and in the straw, were shown at the meetings, which added much interest to the subject and served to explain some of the features of the work carried on at the farm.

Virden, 29th January.—Two sessions, full house each time; subject, "Varieties of Grain."

Brandon, 16th January.—Good attendance; subject "Sowing Grain."

Brandon, 30th January.—Large attendance; subject, "Varieties of Grain."

Wawanesa, 26th February.—Good attendance; subject, "Fodder for Dairy Cows."

Bradwardine, 19th February.—Packed meeting; subject, "Varieties of Wheat and Grasses."

Minnedosa, 12th March.—Fair attendance; subject, "Grain Growing."

Elkhorn, 19th March.—Full house; subject, "Results of Experiments in Grain Growing."

Killarney, 25th March.—Same subject, fair attendance.

Melita, 2nd June.—Same subject, small attendance.

Bradwardine, 4th June.—Subject, "Trees and Flowers."

Shoal Lake, 28th June.—Small attendance; subject, "Grain and Grasses."

Birtle, 28th June.—Large attendance; subject, "Varieties of Grain."

Souris, 5th July.—Good attendance; subject, "Summer Fallow."

New Buildings, &c.

A much needed poultry building has been built during the year; it is 16 x 32 feet, and has compartments for four breeds of fowls. With the object of keeping it at a moderate temperature without artificial heat, the spaces between the studs have been filled with soft or broken bricks laid in mortar. In my next report I hope to be able to speak favourably on this experiment.

A windmill has also been erected on the cattle barn, and is used for pumping water, grinding grain, cutting feed, &c., and has so far given satisfaction.

Working Expenses.

Although a larger number of plots of grain have been sown this year than in any previous season and much additional work undertaken in connection with the care of stock, I am pleased to be able to report that the working staff on the farm has been reduced and the working expenses generally lessened, this result has been possible owing to the land being in a better condition and requiring less work and to the ease with which the past year's crop was harvested.

Samples for the World's Columbian Expcsition.

On the 9th of November last, five thousand pounds of vegetables consisting of thirty-eight varieties of field roots and sixty-six varieties of potatoes besides a number of jars containing fruit and garden vegetables grown on this farm, were shipped to Chicago to be kept there in cold storage until the Exposition opens.

In addition some hundreds of samples of grain both threshed and in the straw have been prepared ready for use in the Canadian Exhibit.

Owing to the press of work in connection with the preparations for this Exposition none of the local Agricultural Exhibitions could be attended this year.

Visitors.

As the Experimental Farm is becoming better known and more accessible by the opening up of new lines of railway the number of visitors increase: this year 4,703 visited the farm, an increase of 1,183 over last year.

The large numbers of visiting delegations from the Eastern provinces and from the United States was a feature of the past year and the farm is credited with materially assisting immigration by showing what crops can be grown here under proper cultivation.

On August 2 the Brandon Farmers Institute held a pic-nic at the farm, and over five hundred from the surrounding country availed themselves of the opportunity to examine the work in progress.

Correspondence.

The correspondence in connection with the work of the farm is constantly increasing and the number of letters received in 1892 reached 2,433, while 2,449 were sent from the farm: the above includes 697 circular letters sent in connection with tree distribution.

I have the honour to remain, sir,

Your obedient servant,

S. A. BEDFORD,

Superintendent.

EXPERIMENTAL FARM FOR THE NORTH-WEST TERRITORIES.

REPORT OF A. MACKAY, SUPERINTENDENT.

INDIAN HEAD, N.W.T., 31st December, 1892.

WM. SAUNDERS, Esq.,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit to you herewith my fifth annual report of work done on the North-West Experimental Farm during the year 1892.

In some respects the season just past has been a great improvement on its predecessor. Although the growth was backward at first, when the June rains came, everything made rapid progress and harvest was much earlier than was at one time thought possible.

The harvest was everything that could be desired. The weather continued fine, almost without a break from first to last, and farmers were enabled to cut their crops without an hour's delay.

Drawing and stacking were quickly and satisfactorily done, and the cutting and threshing has been got through with a comparatively small amount of expenditure of money or labour.

Little or no harm was done by frost to standing grain. In many districts everything was in stook long before frost came; in others, some late patches of oats were slightly injured.

The sample of wheat all over the Territories is exceptionally fine, but unfortunately the yield has not been equally good. In some districts the average is fair, in others poor. On the Experimental Farm the wheat crop has given fair returns. Winds and early spring frosts injured the more tender varieties, causing them to give a small yield. The Indian sorts were short in the straw and the yield small.

Very little barley was grown in the Territories last season, but where grown, if properly put in on well-worked ground, the yield and quality have been good. The growth of straw was short, but the heads were large.

On the Experimental Farm the crop was short in straw, but returned a fair yield of plump, bright barley.

Oats as a general thing have been a light crop throughout the North-West Territories, caused chiefly from their being sown late on stubble land, that may have had two or more crops of wheat preceding them and not sufficient rain for that mode of farming. The yield from the different varieties tested on the Experimental Farm, has been much below the returns from the same varieties in 1891, and the sample is not so good. Rust struck nearly all the sorts before they were fully matured causing the grain to be somewhat shrunken.

Pease, like barley, are grown to a very small extent in the country. On the Experimental Farm a fair return has been obtained from all the varieties tested, and never before has the sample been so fine, large and uniform.

For roots and vegetables the season was not so favourable as 1891. Although the growing season was longer there was not nearly as much rain. Potatoes, perhaps, are an exception, for everywhere the crop has been a good one.

For tree culture, the year just past has been the best since the farm started. Although very little has been done in foreign sorts, for the reason of their failing

repeatedly to stand our climate; a few that have lived through the past four years, have this year shown considerable vitality and give promise of yet becoming trees. The native trees never did better and with their well matured season's growth will no doubt go through this winter better than ever before.

Special attention was again given to fodder and grass cultivation. For fodder, the season was not as good for quantity as 1891, but better for quality. For grass cultivation, the season was anything but favourable. A hard winter succeeded by a cold backward spring, killed or greatly weakened the varieties with few exceptions. Heavy winds completely destroyed all new sown plots, and when the season was over very little was obtained for the time and trouble spent. One variety *Bromus inermis*, gives promise of being a most excellent grass for the North-West. This variety stood the winter and backward spring without the loss of the least vitality and when the other grasses were hovering between life and death, it was making a good growth and was ready to cut when the best of the others was only heading out. Not growing extra high, it made a heavy thick growth at the bottom and will no doubt be a good pasture as well as hay grass.

Before giving in detail the results of the different tests made with grain and other products of the farm, permit me to refer to two matters of great importance to North-west settlers, if to none others, namely: 1st. The unwise manner of sowing grain; 2nd, Smut.

The general observation of everyone travelling through the country last summer was, that wherever crops were put in in good order, they were looking well and when the land was not well worked quite the reverse was the case. Such has been the experience for the past ten years, with one exception, that of last year, in which owing to plenty of rain, the poorest worked land gave as good, if not better returns than the best. The yield of land worked as our soil must be to give regular and satisfactory returns, has borne out the observations of travellers. We have in this district and I doubt not, in others also, farmers who have this year from 30 to 40 bushels per acre on fallow land, while, on their stubble land, equally good soil only 8 to 15 bushels. Granted that a good sample of grain is sometimes obtained from stubble land and that such land matures the grain in a shorter period than fallow; still the risk is very great. The reason of injury to stubble crops is the want of sufficient moisture in the soil to carry the grain over the hot period. Stubble land, whether ploughed in the fall or spring or sown without ploughing at all never has sufficient moisture to carry a crop to maturity unless the June and July rains are in excess of ordinary years. In fallow land, if properly worked sufficient moisture has been stored up to mature grain in the driest year and farmers in the Territories should have every year at least two-thirds of their crop on fallowed land. Not only do settlers risk too much crop on stubble land at its best; that is, after ploughing and sowing in the very best manner; but thousands of acres are put in in the second, third, and even the fourth year, without ploughing a furrow. The stubble is burned off, if possible, and the grain sown by drill and not touched again until cut. This mode of farming may in one year out of ten give a fair crop on good heavy soil; but on light land with a gravelly or a poor sub-soil, the chances are against it producing even a medium crop at any time.

It has before, in my annual report, been pointed out that fallowed land, in a surprising manner, stores up and retains moisture enough to carry grain through the hottest and driest summer. Fallow-land, may in a wet season have too much moisture, causing rank growth of straw instead of quickly maturing the grain, yet our wet seasons are so few in comparison to the dry ones, that the risk is at most only two years out of ten. (1884 and 1891 being the only wet seasons since 1881.) Besides fallows can be made to retain less moisture by putting less work on them. One good ploughing in the months of June or July and surface cultivation afterwards to keep down the weeds, instead of two ploughings will hold less moisture and cause the grain to ripen four to six days earlier. This applies to heavy soil—in lighter land with gravelly or poor subsoil, two ploughings and plenty of surface cultivation should be given—The ploughings should be as deep as possible. On the Experimental Farm, three ways were followed in 1891, in working our fallows: 1st. Ploughing deeply early in the spring and afterwards keeping the weeds down by surface cultivation. 2nd. Ploughing three inches deep first, surface

cultivation afterwards to keep down the weeds, and after harvest ploughed deeply. 3rd. Gang ploughing in the spring and fall with shallow surface cultivation between. Of the three modes the first is recommended for heavy soil, and the second for light land but instead of three inches deep, the land should be ploughed six inches deep at first. The third way ripened the grain four days earlier than the other two but the yield was less.

Another most important point to consider by those farming in the North-west Territories, is Smut, which causes untold loss to the country. Although this enemy of wheat was less prevalent the past season than in 1891, few localities, if any, were entirely free from it. That it can be overcome by treating the seed with bluestone, no matter how badly affected the seed may be, is almost a certainty. It is however, absolutely necessary that the seed be treated properly. In tests made on the Experimental Farm, the past year, the best results were obtained by mixing the bluestone with sufficient water, so that when put over the seed there was enough to thoroughly wet every grain and keep it wet for several hours. In the small plot tests ($\frac{1}{10}$ acre), the same quantity of bluestone was used per bushel as in the field tests, but mixed with more water; and the small plots invariably gave the best results and the least Smut. In the small plots, also, the worst smutted wheat that could possibly be obtained, was used for seed, while the larger plots were sown with seed almost entirely free from it. For the larger plots one pail of water was used to ten bushels of seed; for the smaller plots $1\frac{1}{2}$ pails to ten bushels.

Wheat Tests.

Forty-eight varieties of wheat were tested on the farm the past year, from plots of one-tenth of an acre up to 15 acre fields. In addition to these 6 cross-bred sorts crosses between Ladoga and Red Fife, and White Fife were tested. Nearly the same line of experiments in wheat testing was carried on, as in 1891. The test of sowing the same variety of wheat on the same day of each week for six weeks, gave results very much the same as in 1891. The best results were given by plots sown late in April or early in May. This, no doubt, is accounted for by the spring of both years opening out early and fine and afterwards becoming cold and backwards for several weeks, with heavy frost on a number of nights which not only put back all early sown grain, but killed many of the tender roots.

The last plot of Campbell's White chaff, sown on 20th May, was ripe four days earlier than the first plot, sown on 15th April, and in the Red Fife the 1st, 2nd, 3rd and last sown plots were ripe on the same day. No variety of wheat out of the 48 tested has proved in the past year to be worthy of special notice for earliness and quality combined. While several were extra good in quality they were not much earlier than Red Fife and those that were early were too deficient in hardness and quality to rank with Red Fife. White Connell, a variety much like White Fife, Red Fern, a bearded wheat; Campbell's Triumph, Johnston's wheat and Wellman's Fife were all good. Ladoga, although a fair sample, and returning a fair yield was badly rusted like many of the other kinds. The Indian wheats were all very short in straw and gave a poor yield. It may be desirable to sow some of these sorts another year, more with the intention of crossing them with Red Fife and others, than with the expectation of their proving worthy of future general cultivation.

Test of Different dates of Sowing.

In this test Red Fife and Campbell's White Chaff wheats were used. Commencing on 5th April, each variety was sown on fallowed land, every seven days up to 20th May, excepting on 29th April, when on account of hard frost for several days it was impossible to do anything on land. Campbell's White Chaff is a soft wheat some days earlier than Red Fife and yields rather better. In the Red Fife plots little or no difference could at any time be seen; the first and last sown ripened together. In the Campbell's White Chaff plots the last sown ripened first, though the second sowing

gave the best return. The following is the result the size of the plots was one tenth of an acre.

Varieties.	Sown.	Came up.	Headed.	Ripe.	Matured in.	Height.		Condition.	Weight of Grain and Straw.	Yield per Acre.	Weight per Bushel.
					Days.	Ft.	in.				
Red Fife	April 15	May 18	July 25	Sept. 7	145	3	8	No rust.	510	27·40	63
do	do 22	do 20	do 25	do 7	138	3	8	do	510	30·	63
do	do *29										
do	May 6	May 23	July 25	Sept. 7	124	3	8	No rust.	540	35·40	63
do	do 13	do 25	do 25	do 5	115	3	8	do	500	33·	63
do	do 20	do 31	do 25	do 7	110	3	8	do	610	26·20	62
Campbell's White Chaff.	April 15	do 18	do 25	do 5	143	3	9	Rust on leaves.	540	29·40	60
do do ..	do 22	do 20	do 25	do 5	136	3	9	do	525	38·	60
do do ..	do *29										
do do ..	May 6	May 23	July 25	Sept. 4	121	3	9	Rust on leaves	630	28·50	61
do do ..	do 13	do 25	do 23	do 2	112	3	10	do	640	36·40	61
do do ..	do 20	do 31	do 25	do 1	104	3	9	do	660	33·20	60

* Did not sow on account of frost.

Field Tests.

A field of 25 acres was divided in 5 acre lots and sown with Ladoga, Red Fern, White Fife, White Connell and Campbell's White Chaff. The 4 last named were sown on 15th April. The Ladoga 5 acres, being very wet was not sown until 19th April.

Red Fern and White Connell being thought good wheats for the North-west it was deemed advisable to test them alongside Ladoga and Campbell's White Chaff, two of our earliest wheats and White Fife, a late variety. The result, so far as earliness is concerned, need not be taken into consideration as the backward spring caused the 5 sorts to come in within a few days of one another.

Varieties.	Acres.	Sown.	Came up.	Headed.	Ripe.	Height.		Matured in	Yield per Acre.	Weight per Bush.
						Ft.	In.	Days.	Bush.	Lbs.
Ladoga	5	April 19..	May 17..	July 22..	Aug. 25..	3	6	128	27·30	62
Red Fern	5	do 15..	do 17..	do 20..	do 25..	3	8	132	32·30	62
White Fife.........	5	do 15..	do 17..	do 17..	do 26..	3	4	133	26·00	63
White Connell......	5	do 15..	do 17..	do 18..	do 26..	3	4	133	28·00	62
Campbell's W. Chaff	5	do 15..	do 17..	do 16..	do 22..	3	8	129	32 00	61

Half acre tests.

Seven varieties of wheat having done well last year, both in yield and quality, were this year sown alongside one another to more thoroughly test them. For comparison, three very early Indian Wheats were also sown at the same time. The land was fallow and in good order. In earliness, the Indian Wheats were first in earliness but were poor

in straw, yield and sample. The Australian, Campbell's Triumph and Chilian White were best in quality and yield.

Varieties.	Sown.	Came up.	Headed.	Ripe.	Matured in	Height.	Condition.	Yield per Acre.	Weight per Bush.
					Days.	Ft. In.		Bush.	Lbs.
Golden Drop..	April 18..	May 20..	July 26..	Aug. 29..	133	3 6	Rusted .	20·30	62
Australian.........	do 18..	do 18..	do 18..	do 25..	128	3 6	....	29·02	62
Judket....	do 18..	do 18..	do 20..	do 30..	134	3 6	....	28·00	59½
Campbell's Triumph.	do 18..	do 18..	do 18..	do 25..	128	3 6	....	26·05	60
Defiance..	do 18..	do 18..	do 18..	do 31..	135	3 6	....	26·00	61
Wellman's Fife. ...	do 18..	do 18..	do 19..	Sept. 3..	138	3 9	....	27·40	61½
Chilian White . .	do 18..	do 20..	do 18..	Aug. 25..	128	3 6	....	29·10	61
Ind. Hd. Calcutta...	do 18..	do 20..	do 8..	do 20..	124	2 0	....	15·06	63
Delhi......... ..	do 18..	do 20..	do 8..	do 20..	124	2 0	....	18·30	61½
Karachi..........	do 18..	do 20..	do 10..	do 22..	126	2 0	....	14·38	63½

Test of Different Varieties Sown on Same Date.

ONE–TENTH ACRE PLOTS.

Twenty-six varieties of wheat were sown on same day, on fallow land. All were sown by drill at the rate of 1½ bushels per acre. This experiment was made to find out the earliest and best sorts for future trial. In the 26 kinds are included three Indian wheats for comparison as to earliness. As will be seen, not one of the varieties can claim much this year on the score of earliness. Campbell's Triumph and Ladoga taking the lead by only two days over Red Fife but 15 days behind the Indian sorts. In yield and quality Red Fife, Azima Russian, Assiniboia, Red Fern, Pringles Champlain, Johnston's, White Connell, and Campbell's Triumph are the best. The Indian wheats in this, as in all other tests were very short in the straw and gave a very small yield of rather poor grain.

Varieties.	Sown.	Came up.	Headed.	Ripe.	Matured in.	Height.	Condition.	Weight, grain and straw.	Yield per acre.	Weight per bush.
					dys.	ft. in.			bush.	lbs.
White Connell............	Apr. 19	May 20	July 23	Sept. 9	143	3 8	....	475	29·40	62
Gehun	do 19	do 20	do 10	Aug. 18	121	2 6	Rusted.....	..	17·30	64
Genessee..	do 19	do 20	do 23	Sept. 5	139	3 8	Badly rusted	480	26·10	62½
Old Red River.......	do 19	do 20	do 25	do 7	141	3 9	....	420	26·00	60
Campbell's Triumph........	do 19	do 20	do 23	do 3	137	3 6	Rusted.....	490	26·17	60
Club....	do 19	do 20	do 25	do 5	139	3 0	....	400	21·40	61
Waugh's Delhi	do 19	do 20	do 28	do 10	144	3 2	....	300	13·20	62
Johnston's.........	do 19	do 20	do 23	do 8	142	3 4	....	420	31·30	61
Blue Stem........	do 19	do 22	do 25	do 10	144	3 8	....	460	26·40	58
Red Fife	do 19	do 20	do 24	do 5	139	3 8	....	520	33·20	62
White Fife.	do 19	do 21	do 23	do 5	139	3 8	....	495	25·40	63
Russian Hard Tag	do 19	do 20	do 23	do 7	141	3 6	....	490	30·00	62
Club Bombay............	do 19	do 20	do 10	Aug. 16	119	3 9	....	420	21·00	64
Colorado	do 19	do 20	do 23	Sept. 5	139	3 8	Badly rusted	360	21·30	62½
French Imperial	do 19	do 22	do 25	do 7	141	3 9	....	450	28·30	62½
Carter's Cross-Bred F......	do 19	do 20	do 28	do 9	143	4 0	Badly rusted	540	25·00	58½
Ghirka, Russian.......	do 19	do 21	do 27	do 10	144	3 9	do ..	480	25·00	61½
Azima, Russian...... ..	do 19	do 21	do 25	do 9	143	3 8	do ..	550	33·20	63½
Assiniboia...............	do 19	do 20	do 25	do 5	139	3 9	do ..	565	34·30	61
Anglo-Canadian	do 19	do 20	do 26	do 5	139	3 8	do ..	515	22·50	59½
Red Fern......	do 19	do 20	do 25	do 5	139	3 9	....	520	32·00	62
Pringle's Champlain... ...	do 19	do 20	do 24	do 5	139	3 9	Rusted.....	490	31·50	63
Saxonka................	do 19	do 20	do 24	do 5	139	3 8	do	540	27·50	62½
Ladoga.........	do 19	do 20	do 25	do 3	137	3 9	do	450	26·50	62
Indian Hard Calcutta......	do 19	do 22	do 8	Aug. 16	119	2 0	....	240	12·50	63
Rio Grande.......	do 19	do 23	do 26	Sept. 9	143	3 9	....	....	28·00	60½

Test of Sowing Different Quantities of Seed per Acre.

In this test Red Fife was used and sown on the 20th April. The different quantities had the same chance. Contrary to expectation the plot with the smallest quantity of seed ripened one day earlier than the plot with the largest quantity and gave exactly the same return. Little or no difference could be seen at any time, in the four plots and had there been no dividing space it would have been impossible to say which had the smallest quantity of seed.

Varieties.	Quantity.	Sown.	Came up.	Headed.	Ripe.	Matured in.	Height.		Yield per Acre.		Weight per Bush.
	Bush. per acre.					Days.	Ft.	in.	Bush.	Lbs.	Lbs.
Red Fife............	1	April 20	May 20	July 25	Sept. 8	141	3	9	28	20	62
do	$1\frac{1}{4}$	do 20	do 20	do 25	do 9	142	3	9	28		62
do	$1\frac{1}{2}$	do 20	do 20	do 25	do 8	141	3	9	26	30	62
do	$1\frac{3}{4}$	do 20	do 20	do 25	do 9	142	3	9	28	20	62

Test of Sowing at Different Depths.

Red Fife was again used in this test and as will be seen 2 inches deep gave the best result.

In 1891 the best return was obtained from sowing 1 inch deep. On account of less surface moisture this year 1 inch deep was not sufficient. Below is the result :—

Varieties.	Depth.	Sown.	Came up.	Headed.	Ripe.	Matured in.	Height.		Yield per Acre.		Weight per bush.
	In.					Days.	Ft.	in.	Bush.	Lbs.	Lbs.
Red Fife............	1	Aprl 20	May 20	July 26	Sept. 9	142	3	8	24	30	62
do	2	do 20	do 21	do 26	do 7	140	3	9	27		62
do	3	do 20	do 22	do 26	do 10	143	3	9	22	20	62

Test of Sowing Different Ways.

The press-drill in this test gave better results than the ordinary drill or broadcast, but it is the only test in which the Press has come out ahead. All the plots were somewhat hurt by winds and the broadcast showed the effects through the entire season.

Variety.	How Sown.	Sown.	Came Up.	Headed.	Ripe.	Matured in.	Height.		Yield per Acre.		Weight per bush.
						Days.	Ft.	in.	Bush.	Lbs.	Lbs.
Red Fife...... ...	Broadcast ..	May 12	May 26	July 25	Sept. 9	120	3	8	20	20	62
do	Press-drill ..	do 12	do 23	do 25	do 3	114	3	8	30	20	62
do	Drill	do 12	do 25	do 25	do 6	117	3	8	24		62

Test of Sowing Good and Frozen Seed.

Our best Red Fife seed, also some of our No. 1 frozen Red Fife, with Nos. 2 and 3 frozen, obtained outside the farm, were used in this test. No. 2 was obtained from a grain-buyer and No. 3 from a farmer who was unable to sell at any price. All were sown within two hours of each other on exactly the same worked land, the soil the same and all matured nearly together.

The yield, however, is greatly in favour of the frozen seed. Last year No. 3 frozen gave 38·10, and good seed 32·40 per acre; this year No. 2 frozen gives the best yield, 36·40, though No. 3 frozen is not far behind—33·20, with good seed only 23·40 per acre. These extraordinary and unlooked for results are very difficult to account for.

Variety.	Kind of Seed.	Sown.	Came up.	Headed.	Ripe.	Matured in.	Height.	Yield per acre.	Weight per Bushel.
							ft.in.	Bush.	Lbs.
Red Fife..........	No. 1, hard...	April 20	May 19	July 25	Sept. 8	141	3.8	23·40	62
do	No. 1, frozen..	do 20	do 20	do 25	do 8	141	3.8	30·30	62
do	No. 2, do ..	do 20	do 23	do 25	do 9	142	3.8	36·40	62
do	No. 3, do ..	do 20	do 26	do 25	do 8	141	3.8	33·20	62

Tests of Wheat on Stubble Land.

The land used for these tests had a crop of Red Fife in 1891, and had been fallowed the year before. The stubble was burned off, and four ways followed in sowing, viz. Drill, press-drill, gang-plough and disc-harrow. No work whatever was put on the drilled and press-drilled plots, except sowing the seed with the drills. In the third plot the seed was sown broadcast on the burnt ground, and the plot then ploughed 3 inches deep with a three-wheeled gang-plough, and one stroke of the harrow given after. The same process was followed on the fourth plot, except that a disc-harrow was used instead of the gang-plough. Little or no difference was observed at any time in the plots. The plot sown by press-drill ripened two days earlier than the others.

Different Ways of Sowing on Stubble.

Variety.	How sown.	Sown.	Came up.	Headed.	Ripe.	Matured in.	Height.	Yield per acre.	Weight per Bushel.
						days.	ft.in.	Bus. lbs.	Lbs.
Red Fife..........	Drill..........	May 16	May 26	July 20	Aug. 29	105	3.4	22·30	62
do	Press-drill	do 16	do 26	do 19	do 27	103	3.4	22·	62
do	Gang-plough..	do 16	do 29	do 21	do 30	106	3.4	20·30	62
do	Disc harrow .	do 16	do 29	do 21	do 29	105	3.4	21·40	62

Test of Land treated with different quantities of Superphosphate of Lime.

Some parties having expressed through the press the opinion that superphosphate of lime would hasten the ripening of grain, a quantity was obtained from Ottawa and sown on five plots of one-tenth acre each, in different quantities, and one plot sown without treatment. No difference could be observed in the growth of the plots, and very little in the maturing, but the five plots treated were given the benefit of the doubt. When threshed, an increase in yield was found in favour of the treated: the largest quantity of superphosphate of lime giving the largest number of bushels.

Variety.	Super phosphate per acre.	Sown.	Came up.	Headed.	Ripe.	Matured in.	Height.		Weight of Grain and Straw.	Yield per Acre.		Weight per Bushel.
							Ft.	In.		Bush.	Lbs	Lbs.
Red Fife......	100 lbs	May 6..	May 23.	July 26.	Sept. 8..	125	3	9	260	30	20	61
do	200 do	do 6..	do 23.	do 26.	do 8..	125	3	9	240	32	40	61
do ..	300 do	do 6..	do 23.	do 26.	do 8..	125	3	9	270	31	20	61½
do	400 do	do 6..	do 23.	do 26.	do 8..	125	3	9	280	32	..	61½
do	500 do	do 6..	do 23.	do 26.	do 8..	125	3	9	290	34	20	62
do	Untreated.	do 6..	do 23.	do 26	do 9..	126	3	9	280	29	20	61

Test of Wheat on Root and Corn Land—twelve acres.

In this test the land used had a crop of roots, corn, potatoes and millet the year before. The millet and root land were each ploughed half in the fall and the remainder in the spring. The other land was gang-ploughed in the spring. The seed was sown and gang-ploughed in. On account of this field being greatly exposed to the winds, the grain was longer in maturing than almost any other on the Farm.

Variety.	Kind of Land.	When ploughed.	How sown.	Sown.	Came up.	Headed.	Ripe.	Matured in.	Height.		Yield per Acre.		Weight per Bus.
								Days.	Ft.	In.	Bus.	Lbs.	Lbs.
Red Fife....	Millet..	Fall....	Drill ...	April 14	May 16.	July 17.	Aug. 25.	133	3	9	27	30	62
do	do ..	Spring..	Ganged.	do 14	do 16.	do 17.	do 25.	133	3	9	27	30	62
do	Turnip.	Fall....	Drill ...	do 6	do 16.	do 18.	do 27.	143	3	8	32	10	62
do	do .	Spring..	Ganged.	do 5	do 16.	do 18.	do 27.	144	3	8	32	10	62
do ..	Corn....	do ..	do .	do 4	do 16.	do 18.	do 25.	143	3	8	33	40	62
do	Mangel.	do ..	do .	do 6	do 16.	do 18.	do 27.	143	3	8	30	..	62
do	Potato..	do ..	do .	do 6	do 16.	do 19.	do 27.	143	3	8	32	50	62

Smut Tests.

The seed grain for these tests was obtained from an elevator in town, and was unsalable on account of its smuttiness. Three parts were treated at the rate of 1 pound of bluestone to 5, 7 and 10 bushels of seed, and mixed with 1½ pails of water for 10 bushels. The seed was spread out on the barn floor; the mixture sprinkled over it and the wheat thoroughly stirred. One plot was sown with the seed untreated. Six feet square was accurately cut and every head within this area counted, with the results given. The plots sown with seed treated, 1 pound to 5 and 7 bushels were practically free from smut, the plots sown with seed treated 1 lbs. to 10 bushels had so little that when the

grain was threshed it was free from any sign of smut, except an odd ball; while the untreated was nearly ¼ smut and like the seed unsalable. The yield was also 6 bushels less per acre. After counting the heads the remainder of each plot was cut to obtain yield per acre. No farmer would think of sowing seed as badly affected with smut as was the seed used in this test and with care in treating ordinary seed each spring, little or no smut will result.

Variety.	How treated.	Sown.	Came up.	Headed.	Ripe.	Matured in.	Smutted heads.	Good heads.	Yield per acre.	Weight per bush.
						Days.			Bus. Lbs.	Lbs.
Red Fife..	Untreated..........	April 22	May 21	July 26	Sept. 9	140	207	957	19·10	57
do ..	1 lb. blue stone, 10 bushels wheat..	do 22	do 23	do 26	do 9	140	11	1,454	24·00	61
do ..	1 lb. blue stone; 7 bush. wheat.....	do 22	do 23	do 26	do 9	140	1	1,466	25 20	61½
do ..	1 lb. blue stone; 5 bush. wheat..	do 22	do 23	do 26	do 9	140	2	1,146	25 50	61½

In treating the seed for field lots, one pound of bluestone was used to 5, 7 and 10 bushels of seed, the same as in the one-tenth acre plots, but only one pail of water was used instead of one and one-half pails. This did not moisten the seed sufficiently to allow the bluestone to kill the germs of smut on all the grains, and hence some smut was found in the grain.

Cross-bred Wheats.

Six cross-bred wheats, produced by Professor Saunders, Ottawa, crosses between Ladoga and Red and White Fife, were sown again this year. They suffered considerably from winds, were late in ripening and gave a poor return. Enough was obtained, however, to sow nearly one-tenth acre next season, when they will be more thoroughly tested.

Mr. A. P. Saunders was sent by the director to the Indian Head Farm at the proper season where he cross-fertilized a number of different varieties of wheat and other grain. The crosses made with wheats are chiefly between the early ripening Indian wheats and Ladoga, with Red Fife and Campbell's White Chaff.

It is hoped that good results will be gained from crosses made in this climate.

Following are the names of cross-bred wheats sown this year with their parentage:—

(Bearded)	Carleton.........	Ladoga female	and	White	Fife male.
do	Beta...........	do	do	Red	do
(Bald)	Alpha...........	do	do	White	do
(Bearded)	Prince...........	do	do	do	do
do	Abundance......	do	do	Red	do
do	Ottawa.........	do	do	do	do

Fall Wheats.

In the fall of 1891 four varieties of fall wheat were sown in September. These all came above ground before winter came on, but were entirely killed in the spring. The same varieties were again sown on 28th October, just before the ground froze up, and of course did not germinate. The seed was sown by drill, and put down from 2½ to 3 inches.

In the spring the grain was slow in germinating and made poor progress all season; was very thin, and when threshed gave small yields of only medium grain. Along with

the fall wheats was sown a spring variety—Ladoga—which did little or no better than the fall sorts. The result of tests of grain sown on 28th October is given below.

Varieties.	Sown.	Headed.	Ripe.	Yield per Acre.	Weight per Bushel.
				Bush.	Lbs.
Early Red Clawson	Oct. 28, '91..	July 14, '92..	Aug. 25.....	12	59½
Democrat	do 28, '91..	do 14, '92..	do 25.....	15	60½
Manchester	do 28, '91..	do 14, '92..	do 25.....	14	60½
Royal Prize	do 28, '91..	do 14, '92..	do 25.....	16	60½
Ladoga (Spring)	do 28, '91..	do 14, '92..	do 25... .	14½	61

Barley Tests.

Twenty-two varieties of barley were sown the past year. Most of these have been tested for several years and may be regarded as suitable for the Territories. Very little difference can be observed in the Chevalier family, as all do well. Two old varieties, Golden Melon and Thanet, which for the past three years have done well, have this year done much better than usual, especially in quality, Prize Prolific has given the largest yield, followed closely by Sharp's Improved. Duck-bill, which has heretofore given the best results, this year is not so good. The six-rowed varieties gave small yields the past season, and the sample is also small.

To find out the best time to sow barley, the test of sowing on the same day for six weeks in succession was followed. Two varieties of two-rowed barley were used, viz., Goldthorpe and Kinver Chevalier.

The first sown was on the 18th of April, the earliest practicable date. The third should have been on the 2nd of May, but the ground being covered with snow, it was impossible to do anything in the way of seeding for three days, and this date was consequently missed.

It will be seen that early seeding was not suited to the cold backward spring. The first seeding of both varieties was well up when the cold, frosty weather of 1st May came, and in consequence, not only were the young blades cut down, but one-half of the plants were entirely killed. This left the plots so thin and weak that they took eleven days longer to mature. The best yield was from sowing on the 16th of May, and the last sowing, that of the 23rd of May, matured in 45 days less time than the first sowing.

This result corresponds closely with test made in 1891, on the same line, as both springs were nearly alike; opening out early in April and toward the close becoming cold, with heavy frosts at night. The results are given below:—"Land fallowed in 1891, seed sown by drill at the rate of two bushels per acre, on one-tenth acre plots."

Varieties.	Sown.	Came up.	Headed.	Ripe.	Matured in.	Condition.	Height.	Weight of Grain and Straw.	Yield per Acre.	Weight per Bushel.
					Days.		ft. in.	Lbs.	Bush.	Lbs.
Goldthorpe	Apr. 18	May 18	July 28	Sept. 10	145	Blown .	2 10	....	18·40	48
do	do 25	do 21	do 27	do 5	133	Rusted .	2 10	430	34·24	51
do	May *2									
do	do 9	May 23	July 27	Sept. 3	117	No rust.	2 10	370	30·10	51
do	do 16	do 27	do 25	Aug. 31	107	do ..	2 10	360	36·00	51
do	do 23	June 4	do 25	do 30	99	do ..	2 10	330	31·06	51
Kinver Chevalier	Apr. 18	May 18	do 27	Sept. 9	144	Rusted .	2 8	475	35·40	50
do	do 25	do 21	do 27	do 5	133	do ..	2 10	515	41·12	52
do	May *2									
do	do 9	May 23	July 27	Sept. 5	115	No rust.	2 10	470	41·32	53
do	do 16	do 27	do 26	Aug. 31	107	do ..	2 10	510	46·32	53
do	do 23	June 4	do 25	do 30	99	do .	2 9	515	44·22	52

* Did not sow on account of frost.

Field Lots.

The three varieties chosen for this test were Duck-bill, California Prolific and Prize Prolific, all two-rowed sorts. The crop of straw was short, being only about one-half the ordinary height of these grains. Winds repeatedly swept over the field and retarded the growth and so thinned one-half of the Duck-bill portion, that it was cut before maturing and made into hay.

"Sown on fallow, by drill, at the rate of 1¾ bushels per acre."

Varieties.	Sown.	Came up.	Headed.	Ripe.	Matured in.	Height.		Yield per Acre.	Weight per Bushel.
					Days.	ft.	in.	Bush.	Lbs.
Duck-bill	Apr. 26	May 18	July 27	Aug. 29	125	2	8	31·12	50
California Prolific	May 7	do 21	do 21	do 29	114	2	8	43·36	51
Carter's Prize Prolific	do 7	do 21	do 21	Sept. 6	122	2	9	49·28	51

Half-acre Lots.

Ten sorts were sown in half-acre lots, consisting of two new and eight old varieties. It was intended that all should be sown on the same day, but frost and snow delayed the seeding of four varieties ten days later than the first six sorts sown.

"Sown by drill at the rate of 1¾ bushels per acre on fallow."

Varieties.	Sown.	Came up.	Headed.	Ripe.	Matured in.	Height.		Yield per Acre.		Weight per Bushel.
					Days.	Ft.	In.	Bush.	Lbs.	
Kinver Chevalier	April 26	May 20	July 28	Sept. 5	132	2	8	41	32	54
Beardless	do 26	do 20	do 28	do 5	132	2	9	40	30	52
Thanet	do 26	do 20	do 28	do 4	131	2	8	43	36	53
Improved Chevalier	do 26	do 20	do 29	do 6	133	2	8	30	10	52
California Prolific	do 26	do 20	do 23	do 3	130	2	9	30	40	51
Peerless	do 26	do 20	do 28	do 6	133	2	8	38	36	51½
English Malting	May 7	do 23	do 27	do 5	121	2	9	39	38	54
Mensury	do 7	do 23	do 18	Aug. 23	108	2	9	36	14	50
Baxter's Six-Rowed	do 7	do 23	do 18	do 20	105	2	9	33	16	51½
New Golden Grains	do 7	do 23	do 28	Sept. 10	126	2	8	35	28	51

ONE-TENTH ACRE PLOTS.

Wishing to test as many varieties as possible sown on same date; 13 sorts were chosen and sown on summer-fallow by drill at the rate of $1\frac{3}{4}$ bushels per acre in plots of one-tenth of an acre with the following results:—

Varieties.	Sown.		Came up.		Headed.		Ripe.		Matured in.	Height.		Yield per acre.		Weight per bush.
									Days.	Ft.	In.	Bus.	Lls	Lbs.
Baxter's 6-Rowed	May	5	May	22	July	25	Aug.	24	111	2	9	29	28	51½
Prize Prolific	do	5	do	22	do	27	Sept.	9	127	2	8	48	20	51
Peerless	do	5	do	22	do	27	do	9	127	2	8	41	12	51½
Selected Chevalier	do	5	do	22	do	27	do	9	127	2	8	35	20	51½
New Zealand	do	5	do	22	do	25	do	9	127	2	8	33	16	51½
Thanet	do	5	do	22	do	27	do	9	127	2	8	43	16	53
Golden Melon	do	5	do	22	do	27	do	7	125	2	8	48	36	52
Improved Chevalier	do	5	do	22	do	27	do	7	125	2	4	37	44	52
Large 2-Rowed Naked	do	5	do	22	do	16	Aug.	22	109	2	2	22	44	61
Spiti Valley Naked	do	5	do	22	do	14	do	20	107	2	8	20	20	62
Mensury	do	5	do	22	do	23	do	24	111	2	9	33	16	50
Sharp's Improved	do	5	do	22	do	26	Sept.	5	123	2	6	49	10	52
Rennie's Improved	do	5	do	22	do	23	do	5	123	2	8	41	32	51½

TEST OF SOWING SUPERPHOSPHATE OF LIME.

This test was undertaken for the purpose of ascertaining whether the addition of super phosphate of lime to the soil would induce early ripening. Two plots of one-tenth of an acre each were sown with Duck-bill Barley. On one plot 500 pounds superphosphate of lime was sown with the seed. No difference in length of straw or earliness could be observed, but when the plots were threshed the one with the superphosphate of lime gave 7·24 bushels more per acre. Both plots were injured by wind.

SOWN by drill, on fallow, at the rate of one and three-quarter bushels per acre.

Variety.	Treatment.	Sown.		Came up.		Headed.		Ripe.		Matured in.	Yield per acre.		Weight per bush.
										Dys	Bus.	Lls.	Lbs
Duck-bill	Without fertilizer	May	7	May	27	July	27	Sept.	9	125	29	08	50
do	500 lbs. per acre.	do	7	do	27	do	27	do	9	125	36	32	51

OATS TEST.

Twenty-five varieties were tested; six of which had not been tried on this farm before. Heavy frosts in the latter part of April and first week in May did much harm to all the plots early sown and winds afterwards injured late sown plots, several being entirely killed. Almost all varieties were struck by rust some days before ripening and consequently are much lighter in weight than last year. On account of the very unfavorable season for oats no variety has come out so far ahead as to be worthy of special mention although the Prize Cluster and American Banner gave on the whole the best

results. Some sorts like American Beauty, American Triumph, Early Blossom and Early Etampes were conspicuous by their inability to stand a cold spring, they being entirely killed.

Test of different Dates of Sowing.

In this test Prize Cluster and American Banner were the varieties chosen. The land had been fallowed, was in good order and free from weeds : seed was sown by drill at the rate of 2½ bushels per acre. Like the wheat and barley tests, it was impossible to sow on the 3rd date on account of frost and snow. As will be seen below, the last seedings were the first to mature :

Varieties.	Sown.	Came up.	Headed.	Ripe.	Matured in.	Height.	Condition.	Weight of grain and straw.	Yield per acre.	Weight per bush.
					Ds.	Ft. in.		Lbs	Bush.	Lbs
Prize Cluster......	April 18..	May 20..	July 27..	Sept. 8..	143	3 6	Rusted....	280	25·00	40
do	do 25..	do 23..	do 21..	Aug. 29..	126	3 6	do	395	47·22	40
do	*May 2..	....	....	....	....	......	....	....	......	....
do	do 9..	May 25..	July 22..	Aug. 29..	112	3 6	Rusted.....	360	44·04	42
do	do 16.	do 28..	do 20..	do 22..	98	3 8	Not rusted..	370	45·10	42
do	do 23..	June 4..	do 21..	do 20..	89	3 8	do ..	390	52·32	41
do	do 30..	do 8..	do 23..	do 22..	84	3 8	do ..	360	45·20	39
American Banner...	April 18..	May 20..	July 27..	Sept. 2..	137	3 8	Rusted.....	300	38·18	39
do ...	do 25..	do 23..	do 25..	do 5..	133	3 8	do	380	51·6	40
do ...	*May 2..	....	....	....	....	......	....	....	......	....
do ...	do 9..	May 25..	July 25..	Sept. 3..	117	3 8	No rust.....	360	51·15	40
do ...	do 16..	do 28..	do 23..	Aug. 27..	103	3 8	do	390	51·6	40
do ...	do 23..	June 4..	do 24..	do 29..	98	3 8	do	460	59·24	40
do ...	do 30..	do 10..	do 25..	Sept. 1..	94	3 8	do	360	60 20	39

* Did not sow on account of frost.

Field Lots.

Six varieties were sown in a field of thirty acres. The field had been fallowed the year before, being gang ploughed in the spring and ploughed again later in the season 7 inches deep. Two and a-half bushels of seed were sown per acre. The whole field was greatly hurt by the heavy frost early in May and never sufficiently recovered to give a good crop. The following is the result :—

Varieties.	Sown.	Came up.	Headed.	Ripe.	Matured in.	Height.	Yield per acre.		Weight per bushel.
					Days.	Feet. in.	Bus.	Lbs.	Lbs.
Prize Cluster...	Apr. 21..	May 21..	July 25..	Aug. 29..	130	3 6	46	26	44
Cream Egyptian.	do 22.	do 23..	do 25..	do 30..	130	3 6	42	22	41
American Beauty	do 22..	do 23..	do 27..	Sept. 8..	....	....Cut for silo......			....
Winter Grey....	do 22..	do 23.	do 27..	do 6..	139	3 8	38	00	41½
Black Champion	do 22..	do 23..	do 28..	do 10..	....	... Cut for silo......			....
Can. Triumph...	do 22..	do 23..	do 28..	do 6..	....	.... do			....

Test of Varieties on one-half acre Plots.

Ten varieties were sown on same date on one-half acre plots of fallow. Seed was sown by drill at the rate of two bushels per acre. Two of the new varieties were killed out, being unable to stand the severe frost shortly after they were sown.

Varieties.	Sown.	Came up.	Headed.	Ripe.	Matured in.	Height.	Yield per acre.	Weight per bushel.
					Days.	Feet. in.	Bus. Lbs	Lbs.
Early Etampes	Apr. 21	May 21	....	Killed by	frost and	wind.	....	....
Abundance	do 21	do 21	July 23	Sept. 8	140	3 6	29 14	36½
English White	do 21	do 21	do 23	do 5	137	3 6	42 22	36½
Royal Doncaster	do 21	do 23	do 27	do 6	138	3 8	38 28	37
Bonanza	do 21	do 23	do 18	Aug. 18	119	3 8	35 10	40
California Prolific Black	do 21	do 23	....	Killed by	frost and	wind.	....	....
Joanette	do 21	do 23	July 21	Sept. 7	139	3 0	42 22	36
Giant Cluster	do 21	do 23	do 25	do 7	139	4 0	41 34	33½
Improved Ligowo	do 21	do 21	do 21	do 5	137	3 4	25 30	40½
White Russian	do 21	do 23	do 23	do 6	138	4 0	42 22	38½

Test of one-tenth acre Plots.

Thirteen varieties were sown on the same day on fallow land at the rate of 2½ bushels per acre. Though sown one day earlier than the one-half acre plots, all stood fairly well except Early Blossom which has in several previous tests succumbed to cold weather. Winter Grey which last year gave the best results was very poor this year both in this and in other tests made with it.

The following are the results of this test :—

Varieties.	Sown.	Came up.	Headed.	Ripe.	Matured in	Height.	Weight of Grain and Straw.	Yield per Acre.	Weight per Bushel.
					Days.	Ft. In.	Lbs.	Bush. Lbs.	Lbs.
Bonanza	April 20	May 23	July 23	Sept. 1	134	3 6	330	36 10	40
Winter Grey	do 20	do 23	do 27	do 1	134	3 10	350	34 6	41½
Early Gothland	do 20	do 23	do 29	do 9	142	3 10	....	25 30	40
American Beauty	do 20	do 22	do 27	do 9	142	3 9	310	36 16	38½
Swedish	do 20	do 23	do 22	Aug. 25	127	3 4	380	57 16	37
Welcome	do 20	do 23	do 23	do 25	127	3 8	410	44 00	43½
Canadian Triumph	do 20	do 23	do 22	do 22	124	3 10	410	48 00	41
Cream Egyptian	do 20	do 23	do 23	do 24	126	3 4	410	40 00	41
Early Blossom	do 20	do 23	do 29	Sept. 3	....	3 8	Cut for	ensilage.	
English White	do 20	do 23	do 27	do 3	136	3 8	210	38 8	36½
Banner	do 20	do 23	do 27	Aug. 29	131	3 10	430	39 24	38
Archangel	do 20	do 23	do 22	do 23	125	3 4	350	43 28	37
Prize Cluster	do 20	do 23	do 27	Sept. 3	136	3 6	390	45 00	44

The tests of " Different Quantities per acre ; Different depths of seeding and Different ways of sowing " were badly injured, by winds and are not reliable for comparison.

Test of treatment with Superphosphate of Lime.

Two plots of Prize Cluster, one-tenth acre each, were sown; one of which had superphosphate of lime sown with the seed in the proportion of 500 pounds per acre. No difference could be seen in earliness but a marked difference will be observed in the yield as given below.

Variety.	Treatment.	Sown.	Came up.	Headed.	Ripe.	Matured in	Height.	Yield per Acre.	Weight per Bushel.
						Days.	Ft. In.	Bush. Lbs.	Lbs.
Prize Cluster	Untreated	May 6	May 26	July 23	Sept. 2	119	3 10	34 14	42
do	500 lbs. per acre	do 6	do 26	do 23	do 2	119	3 10	41 26	44

Test of Pease.

Thirty-nine varieties of field and garden pease were tried last season. Although the crop of straw was short, the yield was fairly good, and the sample extra fine.

Test of Field with Garden Varieties.

Nine varieties of field and three of garden pease were sown alongside one another on plots of one-tenth acre. The land had been fallowed and was in good order. Pease were sown at the rate of two and a-half bushels per acre of the small varieties and three bushels of the larger sorts. The result is as given below:—

Varieties.	Kind.	Sown.	Came up.	Podded.	Ripe.	Matured in.	Yield per Acre.	Weight per Bushel.
						Days.	Bus. Lbs	Lbs.
Champion of England...	Field...	May 7....	May 28...	July 20...	Aug. 26..	111	16 40	60
Prussian Blue.........	do ..	do 7....	do 28...	do 22...	do 29..	114	28 20	67
Prince Albert..........	do ..	do 7....	do 28...	do 18...	do 29..	114	28 20	64
Extra Early............	do ..	do 7....	do 28...	do 14...	do 19..	104	23 20	64
White Marrowfat.......	do ..	do 7....	do 28...	do 22...	do 29..	114	25 00	65
Black Eyed do	do ..	do 7....	do 28...	do 22...	do 30..	115	20 00	63
Mummy.................	do ..	do 7....	do 28...	do 18...	do 28..	113	28 40	64
Multiplier..............	do ..	do 7....	do 28...	do 22...	do 29..	114	26 40	64
Crown..................	do ..	do 7....	do 28...	do 22...	do 29..	114	25 00	65
Stratagem..............	Garden.	do 7....	do 28...	do 18...	do 29..	114	13 20	60
Yorkshire Hero.........	do .	do 7....	do 28...	do 14...	do 26..	111	20 00	60
Pride of the Market.....	do .	do 7....	do 28...	do 22...	do 26..	111	20 40	63

Summer Fallow *vs.* Sod, Spring Ploughed.

Two sorts of pease were sown on fallow land and the same on a piece of grass sod (timothy and clover) ploughed just before seeding.

As will be seen there was not much difference in yield but considerable in the date of ripening:—

Varieties.	Land.	Sown.	Came up.	Podded.	Ripe.	Matured in.	Yield per Acre.	Weight per Bushel.
						Days.	Bus. Lbs	Lbs.
Mummy..................	Summer fallowed	May 7....	May 28...	July 18...	Aug. 28..	113	28·40	64
Crown..................	do	do 7....	do 28...	do 22...	do 29..	114	25	65
Mummy............	Sod	do 9....	do 28...	do 18...	do 22..	105	26	64
Crown..................	do	do 9....	do 28...	do 18...	do 20..	103	26·20	65

Test as to Earliness and Quality for Table use.

Twenty-eight varieties were sown in small plots to test them for earliness and quality for table use. The sixteen first mentioned below proved to be the earliest, and the following the best in quality :—Yorkshire Hero, Champion of England, Stratagem, Pride of the Market, Duke of Albany, American Wonder, McLean's Little Gem and Heroine.

By sowing at same time American Wonder for early, Yorkshire Hero for second early, and Champion of England for late, a good succession of table pease may be obtained.

The following varieties were sown :—

Varieties.	Sown.	Came up.	Podded—(used.)	Ripe.	Matured in.
					Days.
Bliss' American Wonder	May 7	May 26	July 3	Aug. 16	101
Extra Early Premium Gem	do 7	do 26	do 3	do 16	101
Carter's First Crop	do 7	do 26	do 5	do 16	101
McLean's Little Gem	do 7	do 26	do 6	do 16	101
Extra Early	do 7	do 26	do 7	do 16	101
Kentish Invicta	do 7	do 26	do 12	do 16	101
American Wonder	do 7	do 26	do 5	do 16	101
Tom Thumb	do 7	do 26	do 7	do 16	101
McLean's Blue Peter	do 7	do 26	do 10	do 16	101
First and Best	do 7	do 26	do 7	do 16	101
Extra Early Star	do 7	do 26	do 7	do 16	101
Early Kent	do 7	do 26	do 10	do 18	103
Yorkshire Hero	do 7	do 26	do 14	Sept. 1	117
Pride of the Market	do 7	do 26	do 14	Aug. 23	108
Stratagem	do 7	do 26	do 18	Sept. 4	120
Telephone	do 7	do 26	do 18	do 3	119
Duke of Albany	do 7	do 26	do 20	do 3	119
Extra Early Dwarf Brittany	do 7	do 26	do 22	do 3	119
Blue Imperial	do 7	do 26	do 22	do 1	117
Laxton's Alpha	do 7	do 26	do 14	do 1	117
Bliss' Abundance	do 7	do 26	do 18	do 1	117
Champion of England	do 7	do 26	do 22	do 3	119
Horsford's Garden	do 7	do 26	do 18	do 3	119
Pride of the North	do 7	do 26	do 18	Aug. 23	108
Laxton's Supreme	do 7	do 26	do 20	Sept. 3	119
No. 10	do 7	do 26	do 22	do 1	117
Heroine	do 7	do 26	do 22	do 6	122
Stanley	do 7	do 26	do 14	do 6	122

Fodder Mixtures.

Various mixtures of grain were sown last spring for fodder, the principal ones being rye, barley and oats. Wheat with other grains last year gave the largest yields but was found when it came to be used to be very coarse and did not make as good hay as barley and oats. This year except in two plots, wheat was not used. Rye, the past season did not make a good mixture with other grain. On account of cold weather keeping back the barley and oats, it was ready to cut ten days before either of the others and consequently the crop came in very unevenly.

Two plots of barley and rye were sown on fallow land on 5th May and cut on 18th July. The rye produced in cured hay 4,800 lbs. and the barley 5,860 lbs. per acre.

Barley and oats were mixed and sown on stubble land which had a crop of wheat the previous year, on May 23rd and cut on August 24th, yielding 2 tons 700 lbs per acre.

On May 16th, oats and barley were sown on stubble land. One plot was gang-ploughed 3 inches deep, a second plot disc-harrowed and the third sown by drill without

being worked in any way. On the first two the seed was sown before ploughing or disc-harrowing was done. The yield of hay from the different plots was as follows :—

Varieties.	Land.	Sown.	Came up.	Cut.	Yield per acre of cured hay.
					Lbs.
Oats and barley	Ganged	May 16	May 30	Aug. 2	2,800
do	Disc-harrowed	do 16	do 30	do 2	2,900
do	Drilled	do 16	do 28	do 2	3,130

On 25th May, six plots were sown on stubble land. One plot was sown by drill with pease mixed with oats. Another plot was sown with the same two varieties, but they were put in separately, which in the end did not make much difference.

The yield of fodder, when cured, on the different plots with dates of seeding, &c., is given below :—

Varieties.	How sown.	Sown.	Came up.	Cut.	Yield per acre.
					Lbs.
Pease and oats	Together	May 21	June 3	Aug. 2	2,130
do	Separate	do 21	do 3	do 2	2,460
Wheat and oats	Together	do 21	do 3	do 2	2,500
Wheat, oats and barley	do	do 21	do 3	do 2	2,550
Rye and barley	do	do 21	do 3	do 2	2,400
Rye and oats	do	do 21	do 3	do 2	2,500

A small field of rye alone was sown on May 23rd and cut for hay on July 18th, yielding $1\frac{3}{4}$ tons per acre. It was again cut on Sept. 15th, giving for the second crop 2,613 lbs. per acre.

Fodder Corn.

Fourteen varieties were tested last season on land which had been fallowed the year previous and before seeding was well ploughed, harrowed and rolled, everything being done to ensure a good crop if it were possible to obtain one. The corn was sown in drills, three feet apart with a common seed drill. After coming above ground a scruffler was used every week until the crop was well advanced. The corn when cut was run through a cutting box and put in the silo. As will be seen, the crop was very light, chiefly owing to repeated wind storms during its early growth.

Varieties.	Sown.	Came up.	Tasselled.	Cut.	Height.	Yield per Acre.	
					feet.	Tons.	Lbs.
Mitchell's Extra Early	May 27	June 18	Aug. 8	Sept. 9	$4\frac{1}{2}$	6	430
Pride of the North	do 27	do 18	do 24	do 9	$4\frac{1}{2}$	7	960
Crosby's Early Sugar	do 27	do 18	do 24	do 9	$4\frac{1}{2}$	7	300
Smut-Nosed-Flint	do 27	do 18	do 24	do 9	$4\frac{1}{2}$	8	390
Angel of Midnight	do 27	do 18	do 24	do 9	$4\frac{1}{4}$	8	280
Red Cob Ensilage	do 27	do 18	do 28	do 9	$4\frac{1}{4}$	6	430
Long-fellow	do 27	do 18	do 28	do 9	$4\frac{1}{4}$	9	700
Mammoth Sweet	do 26	do 22	do 28	do 9	$4\frac{3}{4}$	6	760
Mammoth Southern Sweet	do 27	do 18	do 24	do 9	5	8	1,930
Pearce's Prolific	do 27	do 18	do 24	do 9	$4\frac{1}{2}$	11	220
Thoroughbred White-Flint	do 27	do 18	do 8	do 9	5	9	1,030
Dakota	do 27	do 18	do 8	do 9	5	8	1,930
Cinquantine	do 27	do 20	do 24	do 9	$5\frac{1}{2}$	6	230
Early Cory	do 27	do 20	do 24	do 9	$4\frac{1}{2}$	4	500

Millets, &c.

Different plots of millets were sown on fallow and stubble-land, but all, except one or two plots were of little account. The result is as follows:—

Varieties.	Land.	Sown.	Came up.	Cut.	Yield per Acre. Tons.	Lbs.
Common Millet	Fallow..	May 26	June 18	Sept. 15	2	326
Hungarian Grass	Fallow..	do 26	do 18	Hurt by w	inds.	Plowed up.
Hungarian Grass	Stubble.	do 26	do 18	Sept. 15		1,800
Common Millet	Stubble.	do 26	do 18	do 15	1	600
Golden Millet	Stubble.	do 26	do 18	do 15	1	
Hungarian Grass and Millets	Rootla'd	do 31	do 24	do 15	2	38
Millet Long (large heads)		do 31	do 24	do 15		1,900

In the early part of the season, the growth of the millets was greatly retarded by winds.

Grasses and Clovers.

As before stated, last winter and fall were very severe on grasses and clovers. Out of the nineteen cultivated varieties sown in the spring and summer of 1891, not one had sufficient vitality this spring to produce a crop. Most of the plots were entirely killed; others, such as Lucerne and Meadow Fescue, which have given fair crops in other years, failed the past season. Mixtures of grasses sown with grain in 1891, and which made a good growth in that year and gave every promise of a crop, were, except in low spots where the snow lay last winter, very poor. This field, of five acres, was mown several times during the season to thicken up what grass remained, and extra seed sown in bare spots.

In small plots, in a somewhat protected place, three varieties of Bromus came through safely. One of these, the Austrian brome grass, Bromus inermis, is a very promising grass. Long before the other sorts had started it was growing fast, and was ripe when the best of the other two was heading out. It made a very thick growth at the bottom, and also grew a good length. Bromus pumpellianus and Bromus segetum also made a fair growth. Muhlenbergia glomerata, Muhlenbergia Mexicana and Muhlenbergia sylvatica stood the winter, but made a small growth. The past season more native grass-seed was sown and less of the cultivated sorts. The following grasses and clovers were sown in small plots last spring:—Lucerne, Mammoth Clover, Red Clover, Alsike Clover, Bokhara, Crimson, White Dutch, Meadow Fescue, Orchard Grass, Kentucky Blue Grass, Red Top, Canadian Blue Grass, Sheep Fescue and Timothy. As much seed of the best native sorts was sown as it was possible to obtain, and although a good deal has been destroyed, a considerable quantity has come through.

Rye.

Spring rye was sown early in the spring (6th April) on fallow, for seed, and returned 20·20 per acre. Rye was also sown late in May (26th) on stubble land, which was gang-ploughed three inches deep, and was sown by drill, yielding 18·30 per acre, showing that rye is a safe crop to sow either early or late.

Flax.

Two plots of flax were sown, one of which was entirely killed by winds; the other giving 10 bushels of seed. Fibre Short.

Roots.

The past season has not been as favourable for roots as was that of 1891. On the Experimental Farm the tests made with carrots and mangels were entire failures. Twelve varieties of carrots were sown on the 19th and 26th of May, and though both seedings came up they were completely destroyed by winds. Twelve varieties of mangels were put in on 26th May and 2nd June, but like the carrots were destroyed. Although somewhat injured, turnips fared better than the carrots or mangels. Thirteen varieties were sown on 28th May and 2nd June. The land had been fallowed the year previous and a heavy coating of manure was applied and ploughed in after the spring work was over and the ground well harrowed. Two ways were followed in sowing the turnips, on the flat and on drills. In both ways the plants came up equally well and little or no difference could be observed between them, until they came to be pulled, when it was found that those sown on the flat were very rooty and hard to pull, very much more so than those sown on the top of the drill. The following are the varieties sown, date of sowing, pulling and yield per acre :—

Varieties—First Sowing.	Sown.	Came up.	Pulled.	Yield per Acre.
				Bush.
Purple Top Swede	May 28	June 10	Sept. 20	852
Selected Purple Top	do 28	do 10	do 20	374
Jumbo	do 28	do 10	do 20	365
Carter's Prize Winner	do 28	do 10	do 20	634
Sutton's Champion	do 28	do 10	do 20	456
Carter's Elephant	do 28	do 10	do 20	488
Marquis of Lorne	do 28	do 10	do 20	460
Purple Top	do 28	do 10	do 20	436
Bangholm Improved Purple Top	do 28	do 10	do 20	414
Elephant	do 28	do 10	do 20	406
Bronze Top Extra	do 28	do 16	do 20	414
Mammoth Purple Top	do 28	do 10	do 20	396
Hartley's Bronze	do 28	do 10	do 20	444

Varieties—Last Sowing.	Sown.	Came up.	Pulled.	Yield per Acre.
				Bush.
Purple Top Swede	June 2	June 14	Sept. 20	672
Carter's Elephant	do 2	do 14	do 20	636
Bronze Top Extra	do 2	do 20	do 20	630
Jumbo	do 2	do 14	do 20	630
Sutton's Champion	do 2	do 14	do 20	638
Hartley's Bronze	do 2	do 14	do 20	392
Bangholm Improved Purple Top	do 2	do 14	do 20	584
Marquis of Lorne	do 2	do 14	do 20	440
Carter's Prize Winner	do 2	do 14	do 20	660
Purple Top	do 2	do 14	do 20	632
Selected Purple Top	do 2	do 14	do 20	740
Mammoth Purple Top	do 2	do 14	do 20	572
Elephant	do 2	do 14	do 20	600

Nine varieties of turnips and of mangels and thirteen of carrots were planted last year for their seed. Although the crop of seed was poor, enough has been obtained to thoroughly test the value of home-grown seed next season.

PITTING ROOTS IN FIELD.

Having in the fall of 1891 a large quantity of turnips that it was impossible to find room for in the root-cellars in the barn, they were put in a long pit in the field in the usual Ontario way. The bottom was five feet wide and the turnips tapered to a point on top. The turnips were first covered with a layer of straw three inches thick, then earth three inches thick, and just before freezing up a second layer of straw was put on two inches thick, and a second covering of earth four inches deep. Early in the winter a coating of coarse manure was put over all. Openings were left every ten feet until heavy frost came, when they were closed up. The turnips came out in the spring in very fine condition, not one being rotten or in any way spoiled.

A small pit of potatoes was also put out in the same way as the turnips, except that a hole was dug two feet deep and filled up to top and then covered. On account of there being too few potatoes in the pit, those in the top half were frozen and spoiled, but those at the bottom were perfectly sound.

This fall the turnips required for feeding next spring were pitted in the same maner as in 1891. A large quantity of potatoes were also pitted in the same way except that the pit was dug four feet wide and three feet deep, and the potatoes put in even with the top and covered the same as the turnips.

POTATOES.

Seventy-six varieties were grown the past year and a good crop was obtained from almost all the sorts. The tubers were a fair size but very scabby which may be accounted for by the ground having had a heavy coat of manure before planting, although last year's crop was grown on ground as heavily manured and the potatoes were perfectly free from scab. The land had been fallowed the year previous and well harrowed before planted. Drills three feet apart were opened and sets dropped every fourteen inches. As the plants came above ground it was well harrowed and a scruffler run through each week until the vines covered the ground, when they were ridged up with a plough. Commencing on the 19th August, two hills of each variety were taken up, counted and weighed, each week until the 16 September. The number and weight of each variety in two hills on the first and last testing are giving below.

Tests of sixty-five varieties are given, the remaining eleven not being kept.

POTATOES planted 21st May; taken up 3rd October.

Varieties.	Came up.	Growth.	Matured.	Size.	Weight. (2 rows, 66 feet.)	Bushels per Acre	August 19th. Market-able.	Small.	Weight.	September 16th. Market-able.	Small.	Weight.
									lbs. ozs.			lbs. ozs.
Brownell's Best.	June 21	Strong....	Early ..	Large ..	185	370	6	9	1·12	9	6	4·10
Early Puritan....	do 21	do	do ..	Medium	207	414	8	5	1·10	14	0	5·02
Delaware............. .	do 21	V. strong.	Late. ..	Large ..	246	492	7	2	1·05	11	4	4·01
Brownell's Beauty.......	do 27	Strong....	do	Medium	183	366	9	6	1·09	12	2	3·02
May Queen.	do 21	do	Early ..	do	208	416	12	13	2·08	13	8	4·02
Goodrich	do 24	do	V. late..	Large ..	197	394	2	18	1·02	10	2	3·12
Bliss' Triumph..........	do 27	Medium..	Early ..	Medium	140	280	8	27	2·10	12	3	2·12
Lee's Favourite.........	do 21	Strong....	do ..	do	192	384	8	8	1·14	14	7	5·04
Marigold.	do 24	do ...	do ..	Large ..	203	406	9	9	1·14	17	5	4·10
Halton Seedling.........	do 27	V. strong.	do ..	do ..	157	314	7	16	2·04	13	6	6·00
Prolific.	do 27	Strong....	Late. ..	Small ..	190	380	6	17	1·09	10	12	3·04
Chicago Market.........	do 20	V. strong.	do	Large ..	212	424	13	6	3·02	15	9	6·00
Telephone	do 27	Strong....	do	Medium	155	310	8	17	1·10	26	10	6·08
Early Maine	do 24	do	Early ..	do	249	498	11	12	3·01	10	7	3·00
Member of Parliament..	do 24	V. strong.	Late. ..	V. small	266	532	14	63	4·01	13	19	3·10
Manhattan.......	do 26	Strong....	do	Large ..	184	368	5	13	2·06	9	10	3·01
Early Callao...........	do 27	do	do	Medium	179	358	9	15	2·00	13	9	3·08
Early Conqueror........	do 27	do	do	Large ..	217	434	3	13	1·08	10	3	3·04

POTATOES planted 31st May; taken up 3rd October—*Concluded.*

Varieties.	Came up.	Growth.	Matured.	Size.	Weight (2 rows, 66 feet).	Bush. per Acre.	19th August. Market-able.	19th August. Small.	19th August. Weight.	16th September. Market-able.	16th September. Small.	16th September. Weight.
									Lbs. Ozs.			Lbs. Ozs.
White Elephant	June 27	Strong	Late	Large	209	418	6	13	2·00	12	4	3·14
Richter's Elegant	do 27	do	Early	Small	180	360	11	7	2·04	16	7	3·12
Early Bird	do 27	do	do	V. small	185	370	5	19	1·06	10	4	2·08
Early Summer	do 25	do	do	Large	247	494	17	16	3·03	10	4	3·08
Early Rose	do 25	do	do	do	192	384	12	16	3·14	24	9	7·12
Richter's Gem	do 25	do	Late	Small	206	412	6	32	2·12	13	37	4·04
Snowflake	do 27	do	do	Medium	182	364	0	24	1·06	17	9	3·14
Clarke's Triumph	do 27	do	do	Large	191	382	10	19	2·08	18	7	4·14
Beauty of Hebron	do 27	do	Early	do	178	356	17	6	3·12	21	5	6·02
White Star	do 27	V. strong	Late	Medium	185	370	6	15	1·12	15	6	3·08
Seedling No. 21	do 27	do	do	Small	142	284	5	16	1·06	9	3	2·00
do 98	do 27	do	do	do	97	194	0	16	0·08	7	1	1·08
do 15	do 27	do	do	do	160	320	12	26	2·14	15	8	4·08
do 9	do 27	do	do	Medium	136	272	0	18	0·12	11	3	2·03
Lee's Ex. Early	do 15	V. strong	Early	Large	213	426	12	11	2·09	15	5	4·08
Empress Bell	do 27	do	Late	do	165	330	9	16	2·15	14	0	5·02
Late Rose	do 24	do	do	do	207	414	16	5	3·04	21	5	5·10
London	do 24	do	Early	do	171	342	14	7	2·12	8	2	4·08
Rural New Yorker	do 26	Strong	Late	Medium	158	316	15	17	2 12	9	7	3·08
Vermont	do 24	V. strong	Early	Large	172	344	4	11	2·12	14	8	4·06
Wonder of the World	do 26	do	do	do	203	406	12	13	2·12	18	1	5·10
Lizzie's Pride	do 21	Strong	Late	do	182	364	12	6	3·04	10	3	4·08
Early Eating	do 24	do	Early	Medium	157	314	6	15	2·06	20	10	6·14
Sharpe's Seedling	do 24	V. strong	do	Large	157	314	15	16	3·12	14	6	3·12
Rural Blush	do 24	do	Late	Medium	147	294	0	7	0·08	9	0	3·04
Clarke's No. 1	do 24	do	do	do	158	316	14	12	3·14	11	4	5·08
Assiniboia	do 21	do	do	Large	208	406	7	4	1·12	13	5	5·00
Sugar	do 28	do	do	Medium	137	274	0	17	0·09	10	8	2·12
Ohio Gunner	do 27	Strong	Early	do	132	764	14	10	3·05	10	7	3·00
Count Moltke	do 25	V. strong	Late	Large	218	436	16	15	3·08	19	6	4·14
Brownell's Winner	do 25	do	do	do	225	450	10	14	2·04	13	14	5·12
St. Patrick	do 27	do	do	V. small	243	486	4	71	3·08	16	29	4·08
Crown Jewel	do 25	do	Early	Large	253	506	12	14	2·08	17	11	5·14
Stonewall Beauty	do 25	Strong	do	do	182	364	12	13	3·06	9	6	2·10
Empire State	do 24	V. strong	Late	do	217	434	13	17	3·14	16	3	5·04
Jumbo	do 24	do	do	do	180	360	9	8	2·06	13	1	4·08
Early Ohio	do 27	Medium	Early	do	192	384	11	11	4·04	15	12	5·04
Thorburn	do 27	Strong	Late	Small	135	270	3	20	1·10	21	12	4·02
Vanguard	do 27	do	Early	Medium	170	340	12	21	4·01	16	14	4·08
Algoma No. 1	do 27	do	do	do	151	302	7	10	2·04	11	16	3·08
Seedling No. 2	do 25	V. strong	Late	Large	200	400	8	12	1·14	20	11	7·03
do No. 141	do 27	do	do	V. small	170	340	3	13	0·10	20	17	3·14
do No. 18	do 27	do	do	do	120	240	0	25	0·08	14	26	4·00
do No. 20	do 27	do	do	do	140	280	2	8	0·10	12	5	2·14
do No. 10	do 30	do	do	Medium	120	240	0	3	0·04	2	8	0·14
do No. 80	do 25	do	do	Large	225	450	7	10	1·12	13	3	5·08
Rose's New Giant	do 25	Strong	do	do	186	372	11	10	2·09	15	2	5·08

Tests were made by planting sets with one eye, two eyes and whole potatoes. Two good varieties were chosen for this test and the result was as follows :—

Varieties.	Planted.	Came up.	Taken up.	
Assiniboia 1 eye	May 21	June 27	Oct. 4	11 hills when taken up weighed 40 lbs.
do 2 eyes	do 21	do 27	do 4	do do 30 do
do whole	do 21	do 27	do 4	do do 48 do
Empress Bell 1 eye	do 21	do 28	do 4	do do 34 do
do 2 eyes	do 21	do 28	do 4	do do 30 do
do whole	do 21	do 28	do 4	do do 40 do

Vegetable Garden.

The testing of Garden Vegetables was continued this season, no attempt being made to grow very large specimens of any variety. The object being more to find out such early sorts as will mature each year in the North-west.

Beets.

Four varieties, Early Blood Red, Eclipse Dark Red, Black Night and Lentz were sown in garden on 7th May but were all considerably hurt by winds. Early Blood Red came out best. Eclipse, Lentz and Blood Red were again sown on 4th June. Eclipse and Lentz were a good crop ; the former giving at the rate of 496 bushels per acre and the latter 554 bushels. Blood Red was very poor and was not weighed.

Cabbage.

Eleven varieties were tested with following results :—

Varieties.	Sown in Hotbed.	Trans-planted in Hotbed.	Trans-planted in Ground.	Fit for use.	Pulled.	Remarks.
Autumn King	March 2	Mar. 26	June 1	Oct. 1	Oct. 24	Large but late.
Succession	do 2	do 26	do 1	Sept. 10	do	Fine large heads.
Vandergraw	do 2	do 24	do 1	do 10	do	do do
Ex. Early Express	do 2	do 22	May 28	Aug. 4	do	Very good. Early. Heads small.
American Savoy	do 2	do 22	June 1	Oct. 1	do	Very late. Fair heads. Soft.
Henderson's Early Summer	do 2	do 22	do 1	Sept. 2	do	The best 2nd Ey. Cabbage.
Large Drumhead	do 5	do 22	do 1	do 20	do	Fair. Number of heads soft.
Ex. Early Etampes	do 5	April 3	do 1	Aug. 4	do	Good. Early but small.
Express Early	do 5	do 3	do 1	do 6	do	do do
Flat Dutch	do 5	do 3	do 1	do 6	do	Fair—did not head out well.
Ottawa	do 5	do 3	do 1	Sept. 20	do	do —Our own seed mixed.

Celery.

The following varieties were sown in hotbed :—White Plume, Giant Pascal, Paris Golden Yellow, Dicks Many Hearted and Giant White Solid, but the seed of all except White Plume was so badly mixed that it was the only one transplanted.

This being the second year of testing the White Plume, it may safely be recommended as an early and good kind for the North-west.

CAULIFLOWERS.

Five sorts were tested, but night frosts shortly after they were planted, checked the earliest varieties and only a small percentage formed heads. The late fall favoured the late kinds. The Autumn Giant produced the best heads of the 5 varieties.

Varieties.	Sown in Hot-bed.	Trans-planted in Hot-bed.	Trans-planted in Ground.	Fit for use.	Per cent of good Heads.	Remarks.
White Pearl........	Mar. 2..	April 22..	May 5..	June 22..	20	Fair; early; frost checked growth.
Ex. Early Whitehead	do 2..	do 22..	do 5..	do 20..	80	Good; fine heads.
Early Dwarf Erfurt..	do 2..	do 22..	do 5..	do 15..	30	Fair; came in too soon.
Early Snowball.....	do 2..	do 22..	do 5..	do 15..	30	do do
Autumn Giant.....	do 2..	do 22..	do 5..	Oct. 1..	75	Very late, but good heads formed. Roots of this variety taken up and placed in roothouse on 21st Oct., and good heads found up to 15th Dec.

BEANS.

Twenty-four varieties were planted on 27th May, in hills 2 feet apart, rows 33 inches apart. Out of the 24 varieties only 3 matured before frost came on 12th September. Eight sorts were good for green-beans. Following is the list in full—

BEANS.

Varieties.	Sown.	Came Up.	Fit for Use.	Remarks.
Early Mazagan...........	May 27..	June 15..	Sept. 1..	All cut off with cut-worm. Started again, came on well; late.
Royal Dwarf Kidney......	do 27..	do 20..	do 8..	Did not mature; frozen.
Long Yellow Six Weeks...	do 27.	do 15..	....	Pulled Sept., 12. One of the earliest and best.
Improved Refugee........	do 27..	do 20..	....	Did not mature.
Red Speckled............	do 27..	do 20..	Aug. 8..	do
Dwarf Early Mohawk.....	do 27..	do 20..	do 20..	Very good green.
Yosemite Valley	do 27..	July 1..	do 20..	Strong growth with few pods.
New Cylinder Wax.	do 27..	June 20..	do 24..	One of the best late varieties.
Crystal White Wax......	do 27..	do 24..	do 26..	Very good but late.
Golden Wax..........	do 27..	do 20..	do 16..	Good.
Dwarf German Black Wax.	do 30..	....	....	None came up.
Dwarf German White Wax.	do 30..	do 20..	do 10..	Large crop of short thick pods.
Mam. Red German Wax..	do 30..	do 22..	do 20..	Extra heavy crop of large tender pods.
Yellow Six Weeks........	do 30..	do 20..	do 8..	Green beans good. Ripe September 9.
Canadian Wonder.........	do 30..	do 20..	do 20..	Green beans fair.
Cranberry Pole.	do 30..	do 24..	....	Late; did not pod.
Black Wax Pole	do 30..	do 24..	....	do
Early Golden Cluster......	do 30..	do 24..	....	do
Andalusian Pole..........	do 30..	do 24..	....	do
Giant Red Wax..........	do 30..	do 24..	....	do
Henderson's Bush Lima...	do 30..	do 24..	....	Late.
Broad Windsor...........	do 30..	do 24..	Aug. 8..	Did well.
Early Dun Coloured.. ...	do 27..	do 20..	do 8..	One of the best green beans. Ripe Sept. 9.
Flageolet Wax............	do 27..	do 20..	do 20..	Very good.

CARROTS.

Four sorts were tried. All did well. Sown in drills 13 inches apart.

Varieties.	Sown.	Came up.	Fit for use.	Yield per acre.
				Bush. Lbs
Early Scarlet Short-horn	May 7	June 6	Aug. 10	217·48
Guerande or Ox-heart	do 7	do 6	do 20	390·13
Peer of all	do 7	do 6	do 20	508·12
Forcing Gem	do 7	do 6	do 12	299·28

CUCUMBERS.

Three varieties were tested and all bore a good crop of cucumbers.

Varieties.	Sown.	Bearing.
Early Cluster	April 2	July 8
Giant Pera	do 2	do 12
Early Short Green	do 2	do 8

CITRONS.

Citrons were sown in frame and in open ground on 5th July and fruit ripened from both on 15th Sept.

CORN.

Two sorts of corn were planted, Mitchell's Extra Early and Early Cory. Mitchell's Extra Early had green corn fit to use on 10th Sept. The Early Cory was later by six days and was cut down by frost on 12th Sept.

LETTUCE.

Toronto Gem and Rosedale were sown on 7th May but were cut down by wire worms. Boston Market was sown on 2nd July, was fit to use on 10th Aug., and is highly recommended. Toronto Gem and Rosedale were again sown on 14th July, were fit to use 10th Aug., and continued in use untill the ground froze up early in November.

ONIONS.

Nine varieties of onions were sown in the hotbed and transplanted in the open. The same sorts were also sown in the open ground. Those sown in the open were almost entirely killed by wire worms. Those transplanted were set out in rows 20 inches apart and 4 inches in the row. Dates of sowing, transplanting, when fit for use, and yield are given below.

Variety.	Sown in hot-bed.	Trans-planted in open.	Fit for use.	Yield per acre.	Remarks.
				Bus. Lbs.	
Giant Roca	April 2	May 31	Aug. 10	399 18	Fair size.
Small Silverskin	do 2	June 15	do 1	....	Very small.
Prize Taker	do 2	do 15	do 15	508 12	Good.
Large Red Wethersfield	do 2	do 15	do 15	236 00	Some good. Number of thick neck.
Mammoth Silverskin	do 2	do 15	do 20	254 6	Fair.
Yellow Globe Danvers	do 2	do 15	do 15	471 54	Very good.
Spanish King	do 2	do 15	do 20	598 57	Fair size.
White Barletta	do 2	do 15	do 1	....	Very good.
Red Globe	do 2	do 15	do 15	399 18	do

Parsley.

Triple or Curled, sown 7th May, fit to use 15th August. Good.

Parsnips.

Long Smooth and Hollow Crown sown. Came up 11th June. None were fit to use on account of being eaten by wire worms.

Pepper.

Two varieties were sown, viz.: Spanish and Propopp's Giant, but neither grew.

Sage.

Holt's Mammoth, sown in hot-bed and transplanted. Did well.

Radish.

Olive Shaped and China Pound sown in ground 7th May. Came up well but were killed by worms. Were sown again on 14th June, Olive Shaped producing a good crop; China Pound again killed.

Tomatoes.

Eleven varieties were sown in hot-bed, but only four grew. Following is the test in full:—

Varieties.	Sown in hot-bed.	Trans-planted in ground.	Formed fruit.	Ripe.	Remarks.
Early Ruby	April 2	June 22	July 4	Aug. 15	A fair crop.
Halliway	do 2	do 22	do 4		Had a good crop but did not ripen.
Potato Leaf	do 2	do 22			Did not grow.
Earliest of All	do 2				do
Strawberry	do 2				do
Matchless	do 2	June 22			Formed fruit but did not ripen.
Dwarf Champion	do 2				Did not grow.
General Grant	do 2				do
Canada Victor	do 2				do
Conqueror	do 2				do
Acme	do 2				do

Asparagus.

Bed planted in 1889 was in full bearing this year, but on account of late spring the first cutting did not come in until June. The last cutting, however, extended into August. New bed put out 1891, gave first cutting earlier than old bed, but asparagus was not so large. A large number of roots of this vegetable have been distributed from the farm each spring to many farmers in different parts of the Territories.

Rhubarb.

Four varieties are grown. Stotts, a very large sort, grows stalks three inches in diameter. Victoria, Myatt's Linnaeus and Carleton Club are all good, except the latter which is rather rank, The two former are recommended on account of their excellent flavour.

FLOWER GARDEN.

The following flowers were grown the past year and gave very pleasing results. All or any of the sorts may be recommended for the North-West.

Annuals.

Mignonette, Aurea, extra good.
 do Matchet, very good.
 do Common, good.
Dianthus, Heddiwidgii, very good.
 do Diadem Pink, very good.
 do Chinensis, very fine.
 do Lanceatus, very fine.
Phlox Drummondi, very good.
Godetia, Lady Satin Rose, extra good.
Asters, very fine.
Stocks, Dwarf German, very fine.
 do Dwarf Bouquet, very fine.
 do Dwarf Large flowering, very fine.
Petunias, single and double, very good.
Verbenas, not very good.
Sweet Alyssum, good.
Zinnia, Grandiflora, very good.
Zinnia, Haagenia, very pretty.
Pyrethrum, Golden Feather, fine border.
Pansies, fair flowers.
Portulacca, very fine.
Chrysanthemum, annual, extra fine—good show.
Salpiglossis, very good.
Flowering Flax, a very fine plant for border.
Columbine, very good.
Delphinium, very fine
Lilies, Tulips, Peonies and Iris were fair and made a good show.

FRUIT TREES.

Apple Trees.

Five hundred seedling Russian apple trees planted in the spring of 1890, having stood the winter of 1890 and 1891, without the loss of a single tree, it was expected that the majority, at least, would survive the second winter. I am, however, sorry to report that every tree was dead this spring.

One tree of Red Siberian Crab planted in 1888, alone survives of all the apple and crab trees planted in that year. This tree had a few blossoms the past spring, but they were unfortunately blown off before the fruit set. In the spring of 1891 42 varieties of named Russian apples were planted. All were living in the fall, but were dead this spring.

Three varieties of Russian Dwarf apple tree set out in 1889 are still in existence, but kill back each winter and make very little growth in the summer.

The past spring seven kinds of apple trees—Red Raspberry, Little Hat, Sugar Sweet, Hare Pipka, Blushed Calville, Bodi and Saccharine were planted in a sheltered plot; also three varieties of cherries, viz.: Vladimir, Bessarabian and Titovka.

Currants.

All the varietie of currants bushes produced a full and fine crop of fruit. Raby Castle gave the largest crop among the Red varieties and Black Naples in the black sorts. The earliest fruit was from the Red Dutch and Lee's Prolific (Black) and the largest and finest currants grew on the Fay's Prolific (Red).

The native black currants gave an immense crop of large fruit but were two weeks later in maturing than the cultivated varieties and ripened more unevenly.

Raspberries.

The raspberry bushes the past season did extremely well, more especially the Turner, which gave a large crop of fine berries. The first fruit was ripe on 1st August and the bushes continued bearing up to 1st October. After three years trial this variety is highly recommended for growing in the North-West. The Philadelphia also gave a large crop, but the berries were not so good in flavour as the Turner. Hornet and Dr. Reeder did well, producing a large crop of fine fruit.

Cuthbert, Golden Queen and Caroline were killed back considerably but where protected, all bore fine fruit.

Native Raspberry bushes planted in 1889, produced a fair crop of berries but their flavour was poor in comparison with the cultivated sorts.

Gooseberries.

Were all badly winter killed and bore little or no fruit, Smith's Improved and Houghton each had a few berries.

Strawberries.

New Dominion and Capt. Jack gave a fair crop of poor berries, only one out of ten being perfect. All the vines came through the winter safely and blossomed plentifully, but dry hot winds shortly before the berries matured ruined the crop.

Preparations for Wintering.

The Raspberry canes were all laid down before winter set in, and covered with two inches of earth and over this a coating of rotted manure to keep the earth from blowing off. This covering is left on as long as possible in the spring to retard the early growth.

Strawberry vines are covered with coarse manure after the ground freezes up. Rhubarb and asparagus have a thick coating of manure put over them each fall, which is dug under in the spring.

FOREST TREES.

The majority of the elm trees received from Nebraska, U.S.A., in 1890, were, last winter, again killed back but this summer have made a good growth. The ash—white and green—also received from Nebraska are almost entirely gone, a few barely existing. All others are dead. Norway spruce planted in 1888, which have just existed from that time, the past season under the friendly protection of a hedge of Manitoba maple, made the best ; in fact, the only growth they have made since they were planted.

Very few foreign trees have been set out this season and until the hedges and wind-breaks grow, which have been planted, sufficiently thick to afford protection, there appears to be very little use in making further tests, in this line.

Last spring 10,500 native maples, ash and elms were transplanted into hedges, wind-breaks and other plots on the farm. The trees were 2 and 3 years old and were taken from nurseries on the farm.

Wind-breaks and other plantations of trees, consisting of native varieties, did extra well the past season and promise well for the coming year on account of this summer's growth being well ripened and hardened. The wind-breaks set out for the protection of vegetables, fruit trees, valuable varieties of grain, grasses, &c., made excellent progress, and additions of willow, poplar and artemisia were made to them. I had pleasure in referring, in my last report, to the success of Artemisia abrotans as a hedge plant. This year I have to report its continued success for that purpose. Already this winter, snow banks three or four feet deep, caused by its close and thick growth, cover the fruit trees. As fast as possible, hedges of this shrub will be set out over the whole grounds, and in a few years better success will, without a doubt, attend the growing of fruit and other trees. Next to Artemisia, ranks the native maple as a windbreak. One or two rows sown thickly, will in three years afford considerable shelter to the more

tender trees. Hedges of this tree will also be set out as speedily as possible along roads and other exposed portions of the farm.

Among the shrubs Caragana arborescens, Syringa alba (Lilac), Spirea opulifolia and Ribes aureum (Fowering currant), continue to hold their place well. Caragana is first in hardiness over anything in the tree or shrub line including all the native sorts.

Willows and Poplars.

The Russian Willows, Salix Voronesh and Salix acutifolia and Poplars, Riga Wobstii and aurea again did very well.

CATTLE.

I have pleasure in reporting the stock on the farm to be in good health and condition. At present the pure bred animals consist of Durham, Polled Angus and Holstein, numbering in all 23 head.

The Ayrshires were all shipped to the Experimental Farm at Agassiz, British Columbia, early in the fall, for the reason of there being little or no demand for them here.

A young shorthorn bull—Red Knight, 16,675—has been received from the Central Experimental Farm, purchased from Mr. John T. Hobson, Mosborough, Ont., to take the place of Rosy Prince 8th, whose calves will be coming in next spring. Three Polled Angus females have also been received from the Experimental Farm at Ottawa.

Rations Fed to Stock.

At present the following rations are being fed to stock. Cut feed being green oats cut with Binder and cut up with straw-cutter.

To Cows in Calf.

Morning—9 lbs. cut feed, 2 lbs. mixed meal.
Noon—Wheat straw, $1\frac{1}{2}$ lbs. do
Evening—8 lbs. dry cut feed, 5 lbs. turnips.

To Milking Cows.

Morning—9 lbs. damp cut feed, $2\frac{1}{2}$lbs. meal, 2 lbs. bran.
Noon—Wheat chaff, 1 lb. meal, 1 lb. bran.
Evening—9 lbs. dry cut feed, 7 lbs. turnips, 2 lbs. meal.

To Young Stock.

Morning—$4\frac{1}{4}$ lbs. damp cut feed, $1\frac{1}{2}$ lbs. meal, 1 lb. bran.
Noon—Wheat chaff, 1 lb. meal, $\frac{1}{2}$ lb. bran.
Evening—5 lbs. dry cut feed, 3 lbs. turnips.

To Bulls.

Morning—9 lbs. damp cut feed, $2\frac{1}{2}$ lbs. meal.
Noon—Wheat chaff and straw.
Evening—$8\frac{1}{2}$ lbs. dry cut feed, 6 lbs turnips.

Milking Test of Holstein Cow "Abi."

The results obtained from the milking of this cow, now five years old, are, I think, so good as to deserve being placed on record.

Calved 20th December, 1892.

Test 23rd December, to 22nd January, inclusive, 31 days. Average yield per day, $72\frac{18}{31}$ lbs. or $29\frac{11}{31}$ quarts. Total, 900 quarts or 225 gallons—equal to 2,250 lbs. Dur-

ing the period of this test the cow was milked three times daily—at 7 a.m., 4·20 p.m., and 9 p.m.

Daily Ration.	Quantity.	Total.
	Lbs.	Lbs.
Hay	15	465
Cut oat sheaves	15	465
Turnips	15	465
Ground barley and oats	15	465
Oil cake	4	124
	64	1,984

MILKING TEST, "ABI."

Date.	Morning Milking.	Afternoon Milking.	Night Milking.	Total.	Date.	Morning Milking.	Afternoon Milking.	Night Milking.	Total.
	Lbs.	Lbs.	Lbs.	Lbs.		Lbs.	Lbs.	Lbs.	Lbs.
Dec. 23	25	20	16	61	Jan. 8	27½	28	17	72½
do 24	30½	28	12½	71	do 9	28	30	18	76
do 25	30	29	13	72	do 10	31	27¼	18¾	77
do 26	31	26	12	69	do 11	27½	30¼	15	72¾
do 27	31½	30½	13½	75½	do 12	30¼	29	17½	76¾
do 28	24½	27½	12½	64½	do 13	27½	31	14	72½
do 29	30	29	14	73	do 14	29	29½	14½	73
do 30	30	30¼	14¾	75	do 15	30½	28	15	73½
do 31	32	31	16	79	do 16	30½	28	18	76½
Jan. 1	29	31¼	17½	77¾	do 17	27½	27	15½	70
do 2	33	28	16	77	do 18	25	24	15	64
do 3	30	29½	15½	75	do 19	25½	27	17¼	69¾
do 4	32	28	14¼	74¼	do 20	25	24	13	62
do 5	30¾	30¼	16¾	77¾	do 21	27½	28	15½	71
do 6	30¾	29	14	73¾	do 22	28¼	23¼	16¾	68¼
do 7	30	33	16	79					
						900½	874½	475	2,250

YOUNG STOCK.

Following are weights of young stock on 2nd December, 1892; the date of birth being given:—

Stock.	Date of Birth.	Lbs.
Durhams, pure heifer	June 20, 1891	940
do do	March 26, 1892	530
do grade steer	January 20, 1891	1,155
do grade heifer	do 14, 1891	1,045
do do	February — 1891	1,090
do do	January 20, 1891	885
do grade steer	do 14, 1892	810
do grade heifer	May 5, 1892	500
Polled Angus, pure heifer	October 9, 1891	876
do do	December 6, 1891	730
do do	September 14, 1892	300
do grade steer	January 20, 1892	760
Holsteins, pure heifer	February 10, 1891	965
do do	December 28, 1891	700
do do	September 13, 1892	302
do grade heifer	February 10, 1892	635
do do	April 18, 1892	600

Swine.

During the fall two breeds of pigs were obtained from the Central Experimental Farm, Ottawa, Berkshire and Improved Large Yorkshire, which will form the beginning of these breeds on the farm here.

Experiments in Feeding Frozen Wheat to Swine.

These experiments were made to determine the value of frozen wheat made into pork.

Two large sows, the only pigs available, were shut up on 22nd August, in an open pen, after being weighed, and fed for two months on frozen wheat soaked in water for 24 hours before being fed. The wheat was fed whole.

The pigs were weighed on 22nd October and found to have gained 172 lbs. The weights being 22nd August, 900 lbs., and 22nd October, 1,072 lbs.

The price of pork at Indian Head, on 22nd October, was 7 cents per lb. The value of gain in weight would therefore be $\$12\frac{04}{100}$.

Nine hundred and sixty lbs., or 16 bushels of wheat were fed in the two months; therefore, the value of frozen wheat in pork would in this western country, on the basis of this experiment, be about 75 cents per bushel.

On 22nd October, the feed was changed, and ground instead of whole wheat was fed. The wheat being wet at times of feeding. On 2nd December the pigs were weighed and found to have gained 50 lbs., having eaten 510 lbs. of ground wheat; making price of pork $\$3\frac{50}{100}$ and value of grain $41\frac{1}{4}$ cents per bushel.

The difference in gain in pork for amount of wheat eaten may be accounted for partly by the cold weather, and partly by the age and weight of the animals.

In above experiments the animals were not in a comfortable house, but exposed to the weather, as the majority of North-west pigs are when fattening, and the experiment may show farmers what may be gained by feeding frozen wheat instead of selling it.

Poultry.

I cannot report much success in raising fowls the past year. Commencing very early in the season to eat their eggs, it was some time before enough could be obtained to set hens, or sell to applicants. Ten hens were set from first to last of season bringing out twenty-three pullets and twelve cockerels. From reports received from those to whom eggs were sold, no better success has followed them. No doubt too close confinement for the fowls has been the cause.

Distribution of Grain, Potatoes and Trees.

During the spring 17,770 Seedling Maple, Ash and Elm trees were distributed by mail to applicants throughout the Territories. In addition to forest trees, a distribution of small fruits, chiefly Raspberry and Currant bushes, Cuttings, and Strawberry vines, Asparagus roots, Rhubarb, etc., was made. The larger part of the forest trees were sent in packages of 100 each, and judging from the reports to hand, about 60 per cent of the trees have lived.

This fall 250 dozen Raspberry plants were taken up and healed in for distribution next spring.

Considering the amount of trouble and uncertainty of raising a fair percentage of young trees so sent out, a large quantity of tree seeds were, under your instructions, gathered the past fall for distribution this next spring. As there are a great number of seeds in the small bag intended to be sent to each applicant, and very little trouble in raising trees from the seed, it is confidently hoped and expected that this will prove a successful method to induce farmers and others to go in for tree growing.

It has proved the best, in fact, the only way on the experimental farm to grow trees on our plains, and if the North-west settler will give the seed sent out, a little attention for the first few years, nothing in his tree-growing experience in this country will give him better satisfaction.

Distribution of Grain.

Before seeding commenced 417 three-pound bags of grain, were distributed to settlers in the Territories. The lot consisted of wheat, oats, barley, pease and rye, and these were sent to all parts of the North-west.

Distribution of Potatoes.

Two hundred and nineteen three-pound bags of potatoes, consisting of those sorts which gave the best yield in previous year, were sent to applicants throughout the Territories.

Improvements.

During the past summer an implement house, 28 x 75 feet, has been erected. Besides holding the farm implements and machinery, there is a room for light vehicles; an exhibition room, in which samples of grain in straw and threshed, grasses, &c., grown on the farm, are shown; and a room for cleaning, sorting and storing grain, which is indispensable this year on account of the large quantity of samples being prepared for the Chicago Exposition, of our own and other North-west products.

Ensilage.

As intimated in my last report, 43 tons of ensilage was put in the silo in summer of 1891. Mixed grain, sown for the purpose, was cut green and put in the silo in the following order:—Rye, wheat and oats; rye and oats; wheat; barley and oats; Millets and Hungarian grass; rape; corn. The corn, not being well matured, was not preserved in good condition. Rape was found to be useless and was not eaten by the stock. The millets and Hungarian grass were not very good, but were eaten. Barley and oats came out in good order and the mixture of rye and oats was also good. Wheat, rye and oats was poor, the wheat especially poor and was not eaten. This was no doubt caused by the wheat being coarse and not packing closely. Shortly after commencing to use the ensilage, the thermometer dropped to 40° below zero and the top of the ensilage froze about an inch during the night and continued freezing more or less during the severe weather, but by taking the ensilage out of the silo into the basement an hour or two before using, the frost would go out and leave it in perfect condition.

This year the silo has been filled with mixtures of oats and barley; rye, barley and oats; and oats and corn. All were cut into short lengths by the cutting-box before being put in the silo and the whole covered with two feet of cut straw.

At this date, 10th December, oats and corn are found to be in good condition.

Injurious Weeds.

Two very bad weeds have made their appearance in this vicinity and on the Experimental Farm, and from reports one if not both are to be found in other parts of the Territories. One is called "Tumble Weed," from its habit after ripening its seed of breaking off above ground and tumbling over the country, with every wind, scattering its seed in all directions. This weed belongs to the mustard family and is very like mustard except the flower which is not so large or yellow.

One stalk has been found with 500,000 seeds and any fairly well developed plant contains 75,000 seeds. This weed has been growing in this district for several years but no notice has been taken of it. Last year it made such headway and caused so much loss in fields of grain, that steps should be taken at once to stop its further progress or the whole country will soon be over-run with it. The plants found on the Experimental Farm were from seed dropped last year, and in several places they were very thick. No trouble is found in killing the weed either by ploughing, harrowing or pulling up. Cutting it above ground only adds to the number of seeds in the end. Samples of this weed have been sent to Mr. James Fletcher, Botanist of the Experimental Farm, Ottawa, who will no doubt report more fully on it.

Another and perhaps better known weed than the above is French or stink weed, which is causing so much trouble in the Red River settlements. It was also found on

the Experimental Farm last year and has obtained a foothold in other sections of this country. This weed, unlike the Tumble weed, drops its seed where grown and eventually covers the entire land, killing all other growth. Both weeds were shown last fall at a Dairy Meeting in Regina, held during the Regina fair, and to Members of the Legislative Assembly, who were advised of the dangerous habits of these weeds. It is hoped steps will be taken while these weeds are confined to small sections of the country to entirely eradicate them.

No mention is made of other weeds such as Pig weed, Wild Buckwheat, &c., which every settler has according to his mode of farming, but I wish to draw special attention to the new comers on account of their dangerous habits and recent arrival amongst us.

Smudges.

Last year exception was taken to the results of a smudge test made on the Experimental Farm, for the reasons, 1st, That the smudges were not started soon enough before the freezing point was reached, and 2nd, on account of the low point to which the thermometer fell on that occasion.

This year to test these points more thoroughly, material was placed around a one-tenth acre plot of wheat, to be ready for the first frost, which did not come, however, till the night of the 12th and 13th of September. All wheat having been cut prior to this date the smudge material was moved to a one-tenth acre of late sown oats.

Early in the evening the smudge was prepared and lighted at 10.45 o'clock, when the thermometer indicated 36°, or 4° above freezing. The wind being from the south, two instruments were placed 100 feet south of the smudges. One was placed 3 feet 9 inches above the ground; the other one foot above. Two other thermometers were put in the grain; one even with heads of grain 3 feet 9 inches above ground, and the other one foot from the earth. A thick heavy cloud of smoke continually passed through and over one-half of the plot on which the instruments were, and the other half was left to see difference between smoked and non-smoked portions. During the first hour after the smudges were started the temperature fell 3°, all the thermometers recording 33°. At 12 o'clock the two instruments away from the smoke, and the one in the grain even with the heads, registered 32°, or freezing; while the one in the grain, one foot from the ground recorded 31°, or 1° of frost. At 12.15 o'clock all the instruments were up 1°, making the three to indicate 33° and the one 32°. At 12.30 the downward course was again taken and at 1 o'clock the three thermometers recorded $1\frac{1}{2}$° frost and the other one $2\frac{1}{2}$°. The lowest point reached was at 1.20 o'clock when the three thermometers registered 29° or 3° of frost and the one 28° or 4° frost.

The three thermometers that continually kept together are three of the four used last year and were inspected one month before the test by an officer from the Meteorological office, Toronto, and pronounced perfectly accurate.

The instrument placed 1 foot above ground in the grain was an ordinary thermometer bought at a store for 50 cents and probably was not perfectly accurate when the temperature fell below freezing.

No injury was done to the grain and between the smoked and unsmoked portions, no difference could ever be observed; showing that 3° of frost will not injure oats, at least, whatever it may take to hurt wheat.

The three correct thermometers falling together, one of them always in the smoke, indicates that smoke has no effect on the temperature, whatever effect it may have on the grain, and it is reasonable to conclude that if smoke has no effect on the temperature, grain will certainly suffer when a low enough point is reached.

Samples of Grain, Grasses, &c., Prepared for Chicago Exposition.

Under your instructions, a number of samples of grain in the straw of each variety grown on the farm have been prepared for the Chicago Exposition, also samples of threshed grain of all varieties.

Early in November a collection of roots and vegetables grown on the Experimental Farm and throughout the Territories, was shipped to Chicago.

A collection of native grasses, numbering 63 varieties, all named, and gathered principally on the farm, and 17 cultivated varieties grown on the farm has been prepared for the same purpose.

Under directions of the North-west Government, collections of grain in the straw, samples of threshed grain, collections of native grasses, &c., have been or are now being made by the agricultural societies, towns and private individuals, and forwarded to the Experimental Farm, where they are being sorted and repacked, and early in the new year will be shipped to the Chicago Exposition, and there shown.

In addition to the above, ten boxes of samples of wheat, barley, oats and peas in straw and threshed have been prepared for the Department of the Interior and shipped to Winnipeg for immigration purposes.

These collections have entailed on our small staff a large amount of extra work thereby causing our regular work to be somewhat interfered with.

Stallion.

In April the Clyde stallion James Arthur, 1734 (5688) from the Haras National of Montreal, arrived on the farm. Forty-three mares were served during the season.

Meteorological.

Temperature, rainfall and sunshine, maximum and minimum for twelve months; rainfall for the growing season; sunshine for the growing season.

Temperature.

Months.	Maximum.	Minimum.
January	40° on 23rd.	—44° on 18th.
February	32° on 22nd and 23rd	—35° on 15th.
March	51° on 30th	—27° on 15th.
April	64° on 22nd	7° on 8th.
May	85° on 22nd	5° on 1st.
June	83° on 18th	33° on 13th.
July	96° on 6th	36° on 25th.
August	98·5° on 1st	40° on 9th and 22nd
September	87 on 28th	25° on 30th
October	81° on 5th.	15° on 29th
November	45° on 4th	—13° on 21st and 22nd
December	19° on 8th	—15° on 2nd

Rainfall.

	Inches.
April	.6
May	.82
June	2·59
July	1·09
August	·89
September	·93
Total	6·92

Sunshine.

	Hours.
March	121·1
April	129·5
May	173·9
June	214·2
July	309·2
August	232·4
September	166·1
Total	1,346·5

Exhibitions Attended.

On account of the large amount of work and material required for the Chicago Exposition, only one exhibition in the Territories, away from home, was attended the past fall at which products of the farm were shown.

The annual exhibition at Regina being considered very important, as large a collection of grains and grasses as could be prepared was shown there. It was intended to show at Grenfell and Wolseley, but time would not permit. These will be reached next year if possible.

I have the honour to remain,

Your obedient servant,

ANGUS MACKAY.

EXPERIMENTAL FARM FOR BRITISH COLUMBIA.

REPORT OF THOMAS A. SHARPE, SUPERINTENDENT.

AGASSIZ, B.C., 31st December, 1892.

To WM. SAUNDERS, Esq.,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith my report for 1892, being the fourth annual report of the work done on the Experimental Farm at Agassiz.

The weather during January, February and March was mild and wet. The lowest reading of the thermometor was on January 10th, when it showed 7 above zero, but it continued cool and wet through April and until towards the last of May, and the spring growth was slow and backward in consequence. During the last week in March and the first two weeks in April we had slight frosts which had a very damaging effect on the fruit blossoms, destroying the peach, apricot and nectarine, as well as a large portion of the plums. These frosts were not confined to this locality, but were very general along the coast as far south as the orange districts of California.

The season for grain, roots and hay has been a fairly good one, and these crops are a good average over the whole province, with fine weather for harvesting all grain that had been got into the ground in good season in spring. Those fields sown late, ripening during the latter part of September, were difficult to harvest, as September was a very rainy month.

The fall wheat suffered from the wet during winter and the long continued, cool, wet weather in spring, and as a result is a very poor crop, some of the varieties being nearly killed out.

No new land has been ploughed this year, but about twenty acres have been got ready: the large trees and stumps grubbed out and the brush cut.

The land seeded down is showing a good catch of grass, both clover and timothy. The tares sown last fall made an early start, and were ready to cut for feed early in May, having as early as May 5th made a growth of three feet.

I am glad to be able to report that throughout the province generally the crops of grain and roots have been good.

This has been in many places, an off year for fruit, most varieties being light in yield, but everywhere the area in fruit is being rapidly extended.

Hops, also, are receiving considerable attention, there being several yards of considerable extent in the Sumas and Chilliwack districts, three in this neighbourhood and several in the Okanagan Valley, from all of which come good reports. And there is a good prospect of hops being a profitable crop to raise, as the soil and climate appear to be well adapted for their production.

FALL WHEAT.

Twenty-three varieties of fall wheat were tested this year.

The climate does not appear to be suited to fall wheat, as the grain changes rapidly, and after one or two years becomes very soft, and the winters, although very mild, appear to be hard on the wheat plant. The varieties tested on the Experimental Farm suffered to a considerable extent, and the yields were very light.

The following table shows the yield per plot of $\frac{1}{20}$ of an acre, and the time from sowing to harvest. Seed used, 90 lbs. per acre.

Varieties.	Date of sowing.	Headed.	Harvested	Length of Straw.	No. of Days to ripen.	Yield of $\frac{1}{20}$ of an Acre.	Yield per Acre.	
				Feet.		Lbs.	Bush.	Lbs.
Carter's Hybrid A	Nov. 11	June 18	Aug. 6	3 to $3\frac{1}{2}$	268	$28\frac{1}{2}$	9	30
do B	do 11	do 17	do 4	4 to $4\frac{1}{2}$	266	40	13	20
do C	do 11	do 20	do 3	3 to $3\frac{1}{2}$	265	28	9	00
do D	do 11	do 21	do 3	$3\frac{1}{2}$ to 4	265	$22\frac{1}{2}$	7	30
do F	do 11	do 9	July 28	$3\frac{1}{2}$ to 4	259	14	4	40
do G	do 11	do 23	Aug. 5	3 to $3\frac{1}{2}$	267	11	3	40
do H	do 11	do 20	do 4	$3\frac{1}{2}$ to 4	266	18	6	00
do J	do 11	do 16	do 4	$3\frac{1}{2}$ to 4	266	$26\frac{3}{4}$	8	55
do K	do 11	do 15	do 2	4 to $4\frac{1}{2}$	264	56	18	40
Democrat	do 10	do 6	do 8	3 to $3\frac{1}{2}$	266	$26\frac{3}{4}$	8	55
Tasmania	do 10	do 8	do 5	3 to $3\frac{1}{2}$	268	23	7	40
Manchester	do 11	do 7	do 4	3 to $3\frac{1}{2}$	266	15	5	00
Velvet Chaff	do 10	do 9	July 29	$3\frac{1}{2}$ to 4	261	19	6	20
Square Head	do 10	do 17	Aug. 10	3	273	$8\frac{1}{2}$	2	50
Early Red Clawson	do 10	do 2	July 26	4	258	$29\frac{1}{2}$	9	50
Golden Cross	do 10	do 6	do 27	3 to $3\frac{1}{2}$	259	$18\frac{1}{2}$	6	10
Royal Prize Red	do 10	do 20	Aug. 6	3	269	$17\frac{1}{2}$	5	50
Fill Measure	do 10	do 19	do 5	3 to $3\frac{1}{2}$	268	$22\frac{1}{2}$	7	30
Volunteer	do 10	do 5	July 29	3 to $3\frac{1}{2}$	261	46	15	20
Carter's E	do 10	do 22	do 27	$3\frac{1}{2}$ to 4	259	44	14	40
Amber (Martin's)	do 10	do 14	do 27	$3\frac{1}{2}$ to 4	259	35	11	40
Golden Drop	do 10	do 21	Aug. 5	$2\frac{1}{2}$ to 3	268	Killed out.	....	....
White Queen	do 10	do 18	do 5	3	268	....	Only a few heads ripened.	

EXPERIMENTS WITH SPRING WHEAT, BARLEY AND OATS.

Plots of one-twentieth of an acre of wheat, barley and oats, were sown on the same day, and on land that had been first ploughed in August of 1891. The soil was uniform in character, and similarly treated in each case.

Plots sown, Spring Wheat, at the rate of 90 lbs.—$1\frac{1}{2}$ bushels per acre.

Varieties.	Sown.	Up.	Headed.	Ripe.	Length of Straw.	Days to Ripen	Yield per Plot.	Yield per Acre.	
							Lbs.	Bush.	Lbs.
Ladoga	May 12	May 19	July 4	Aug. 20	$2\frac{1}{2}$ to 3 ft.	100	52	17	20
White Fife	do 12	do 18	do 4	do 30	3 to $3\frac{1}{2}$ ft.	110	38	12	40
Russian Hard Tag	do 12	do 19	do 8	do 26	$2\frac{1}{2}$ to 3 ft.	106	$41\frac{1}{2}$	13	50
Rio Grande	do 12	do 17	do 6	do 30	$3\frac{1}{2}$ to 4 ft.	110	62	20	40
Judket	do 12	do 18	do 11	do 29	3 to $3\frac{1}{2}$ ft.	109	52	17	20
Saxonka	do 12	do 17	do 7	do 27	$2\frac{1}{2}$ ft.	107	52	17	20
Pringle's Champlain	do 12	do 17	do 9	do 27	3 to $3\frac{1}{2}$ ft.	107	58	19	20
Gehun	do 12	do 17	do 9	do 29	$2\frac{1}{2}$ to 3 ft.	109	35	11	40
White Russian	do 12	do 18	do 7	do 26	$3\frac{1}{2}$ ft.	106	$52\frac{1}{2}$	17	30
White Delhi	do 12	do 18	do 11	do 29	$3\frac{1}{2}$ ft.	109	46	15	20
White Connell	do 12	do 19	do 12	do 26	3 to $3\frac{1}{2}$ ft.	106	$35\frac{1}{2}$	11	50
Defiance	do 12	do 19	do 11	do 29	2 to $2\frac{1}{2}$ ft.	109	35	11	40
Wellman's Fife	do 12	do 19	do 7	do 28	$3\frac{1}{4}$ to $3\frac{1}{2}$ ft.	108	45	15	00
Indian Hard Calcutta	do 12	do 18	do 6	do 26	2 ft.	106	$29\frac{1}{2}$	9	50
Colorado	do 12	do 18	do 7	do 29	$3\frac{1}{2}$ ft.	109	50	16	40
Red Fife	do 12	do 18	do 7	do 30	$3\frac{3}{4}$ ft.	110	$65\frac{1}{2}$	21	50
Campbell's White Chaff	do 12	do 17	do 14	do 27	$3\frac{1}{2}$ ft.	107	$81\frac{1}{2}$	27	10
Campbell's Triumph	do 12	do 18	do 16	do 28	$3\frac{1}{2}$ ft.	108	72	24	00
Anglo-Canadian	do 12	do 18	do 19	Sept. 2	$3\frac{1}{2}$ ft.	113	49	16	20

It will be seen that Campbell's White Chaff, Triumph and Red Fife have been the heaviest yielders which corresponds closely with the experience of 1891.

BARLEY.

Plots sown at the rate of 96 pounds (2 bushels) per acre.

Varieties.	Sown.	Up.	Headed.	Ripe.	Length of Straw.	Number of days to Ripen.	Yield per Plot.	Yield per Acre.	
					Ft.		Lbs.	Bush.	Lbs.
Goldthorpe	May 12	May 19	July 16	Aug. 25	2½ to 3	105	67½	28	6
Golden Melon	do 12	do 21	do 16	do 25	2¾	105	52½	21	42
Saale	do 12	do 18	do 16	do 25	2½ to 3	105	67	27	44
Duck-bill	do 12	do 21	do 15	do 25	3	105	73½	30	30
Webb's Kinver	do 12	do 21	do 14	do 24	2½	104	56	23	16
Peerless White	do 12	do 19	do 16	do 27	2¼ to 2½	107	64½	26	42
Improved Chevalier	do 12	do 20	do 16	do 26	2 to 2½	106	67½	28	6
Danish Chevalier	do 12	do 22	do 14	do 25	2 to 2½	105	67	27	44
Rennie's Improved	do 12	do 20	do 7	do 22	2 to 2½	102	67	27	44
Odessa	do 12	do 20	do 7	do 18	2½ to 3	98	57	23	36
Oderbruch	do 12	do 19	do 5	do 8	2 to 2½	88	38½	13	46
Common Six Rowed	do 12	do 20	do 9	do 25	2	105	46½	19	18
Six Rowed Wheat, barley	do 12	do 18	do 9	do 12	2½	92	53	22	4
Mensury	do 12	do 19	do 6	do 10	3	90	68	28	16
Spiti Valley	do 12	do 18	do 4	do 9	1½	89	46	19	8
New Golden Grains	do 12	do 18	do 8	do 26	3	106	72¼	30	5

In 1891 the Common six-rowed, Goldthorpe and six-rowed wheat barley proved the best yielders; in 1892 the Duck-bill, New Golden Grains and Mensury take the lead in this respect.

OATS.

Plots sown at the rate of 2½ bushels per acre.

Varieties.	Sown.	Up.	Headed.	Ripe.	Length of Straw.	Number of days to Ripen.	Yield per Plot.	Yield per Acre.	
					Ft.		Lbs.	Bush.	Lbs.
Prolific Black Tartarian	May 13	May 20	July 23	Aug. 30	2 to 2½	109	77	45	10
Black Tartarian	do 13	do 20	do 23	do 30	2 to 2½	109	74	43	18
Bonanza	do 13	do 21	do 18	do 25	4 to 4½	104	60	35	10
Canadian Triumph	do 13	do 20	do 16	do 25	4½	104	75	42	32
Egyptian	do 13	do 21	do 24	do 30	3 to 3½	109	86	50	20
Challenge	do 13	do 22	do 19	do 26	4½ to 5	105	87½	51	16
White Poland	do 13	do 22	do 20	do 26	4½	105	94	55	10
Rennie's Prize White	do 13	do 22	do 17	do 24	4¾ to 5	103	80½	47	14
Early Archangel	do 13	do 20	do 21	do 31	2½ to 3	110	50	29	14
Rosedale	do 13	do 20	do 19	do 31	3 to 3½	110	52	30	20
Welcome	do 13	do 20	do 20	do 31	3½ to 4	110	43	25	10
American Triumph	do 13	do 21	do 27	do 31	3½ to 4	110	35½	20	30
Golden Sided	do 13	do 21	do 20	do 31	3 to 3½	110	66½	39	4
Victoria Prize White	do 13	do 21	do 16	do 22	4 to 4½	101	75½	44	14
White Russian	do 13	do 21	do 21	do 26	3½ to 4	105	44½	26	6
Prolific Black Californian	do 13	do 20	do 30	do 31	3 to 3½	110	77¼	45	15
Black Brie	do 13	do 19	do 2	Sept. 6	4 to 4½	117	68¼	41	6
Early Etampes	do 13	do 18	do 28	Aug. 30	2½ to 3	109	84¼	49	19
Giant Cluster	do 13	do 21	do 31	do 31	4½ to 5	110	108	63	18
Joanette	do 13	do 20	do 24	Sept. 2	3 to 3½	112	80¼	47	9
Improved Ligowo	do 13	do 20	do 24	Aug. 30	4 to 4½	109	123	72	12
Doncaster Prize	do 13	do 18	do 24	Sept. 1	4½ to 5	111	94¼	55	15
Abundance	do 13	do 21	do 25	Aug. 29	4½ to 5	108	88¾	52	7
Early Gothland	do 13	do 19	do 25	do 29	4	108	104¾	61	21
Giant Swedish	do 13	do 20	do 26	do 28	2 to 2½	107	74	43	18
Hazletts Seizure	do 13	do 21	do 27	do 29	3 to 3½	108	56½	33	8
Flying Scotchman	do 13	do 20	do 29	do 20	3½ to 4	99	66	38	28
Early Blossom	do 13	do 20	do 31	do 30	3½	109	78	45	30
Holstein Prolific	do 13	do 21	do 30	do 23	3 to 3½	102	37	21	26
Early Race Horse	do 13	do 19	do 23	do 26	3 to 3½	105	57¾	33	33

Two of the newly imported varieties of French oats, Improved Ligowo and Giant Cluster, head the list as to yield followed by Early Gothland and Doncaster Prize.

SAUNDERS' CROSS-BRED WHEATS.

These were sown with the Planet Junior seed drill, in drills 9 inches apart, and along side were sown fifty grains each of six of the standard varieties of spring wheat, to compare the earliness of the different varieties:—

Varieties.	Amount of Seed Sown.	Date of Sowing.	Came up.	Headed.	Ripe.	Size of Plot.	Yield per Plot.	Yield per Acre.		Days to Mature.
						Square Feet.	Lbs.	Bush.	Lbs.	
Abundance	12 oz.	April 28	May 5	July 2	Aug. 26	900	$42\frac{1}{2}$	34	17	120
White Russian	50 grs	do 28	do 5	do 16	do 29					123
Alpha	$10\frac{1}{2}$ oz.	do 28	do 5	do 1	do 22	840	36	32	42	116
Anglo Canadian	50 grs	do 28	do 6	do 11	Sept. 1					126
Beta	9 oz.	do 28	do 6	do 9	Aug. 30	770	$32\frac{1}{2}$	30	28	124
Campbell's White Chaff	50 grs	do 28	do 5	do 6	do 24					118
Carleton	$10\frac{1}{2}$ oz.	do 28	do 6	do 4	do 23	840	32	27	$39\frac{1}{2}$	117
White Fife	50 grs	do 28	do 5	do 8	do 27					121
Ottawa	$5\frac{1}{2}$ oz.	do 28	do 6	do 7	do 28	460	20	31	34	122
Campbell's Triumph	50 grs	do 28	do 6	do 8	do 27					121
Prince	$2\frac{1}{2}$ oz.	do 28	do 6	do 5	do 31	240	14	42	21	125
Australian	50 grs	do 28	do 6	do 8	do 29					123
Bearded Alpha	$1\frac{1}{4}$ oz.	do 28	do 5	do 7	do 27	120	6	36	18	121
California White	50 grs	do 28	do 8	do 13	Sept. 4					129

Some of these new varieties have thus far proven to be very productive.

TESTS OF EARLY, MEDIUM AND LATE SOWING ON PLOTS OF ONE-TENTH OF AN ACRE.

Two varieties of each wheat, barley and oats were sown, beginning 12th April and continued each week until 24th May. The land had been fall ploughed, and before each sowing the unsown land was thoroughly harrowed, which may partly explain the heavier yields given by the late sown plots.

The grain on the earlier sown plots is brighter and of better quality than the later ones, and the straw appears to be stiffer, standing up better, also freer from smut. The following gives in detail the result of each test:—

TEST of Spring Wheat, Barley and Oats sown in plots one-tenth of an acre, in successive sowings one week apart.

SPRING WHEAT—RED FIFE.—(Sown at the rate of 1½ bushels per acre.)

Date of Sowing.	Date of coming up.	Heading out.	Harvested	Length of Straw.	No. of days to ripen.	Weight of Grain.	Bushels per acre.		Remarks.
				ft.		1/10-acre. lbs.	bush.	lbs.	
Plot No. 1. April 12........	April 23..	July 2..	Aug. 16..	3 to 3½	126	193	32	10	Straw bright and stiff; stood up well; heads long and well filled out to tip; grain plump and of good quality.
Plot No. 2. April 19..........	May 2..	do 5..	do 18..	3 to 3½	121	131	21	50	Straw stood up well, but not so well headed as plot No. 1, nor as well stooled; grain plump. Plots No. 2 and 3 were sown on the banks of a small ravine that had been scraped off in levelling, which lowered the yield. This ravine extended across the field and lowered the yield of plots No. 1, 2 and 3 of each variety.
Plot No. 3. April 26	do 5..	do 9..	do 26..	3 to 3½	122	141	23	30	Stood up well and well headed; heads filled to tip; grain plump and bright.
Plot No. 4. May 3..........	do 12..	do 11..	do 27..	3 to 3½	116	194	32	20	Stood up well and stooled very well; heads very long and well filled out to tip; grain plump.
Plot No. 5. May 10...........	do 16..	do 14..	do 30..	3 to 3½	112	172½	28	45	Straw strong; heads long and well filled, but grain not so good in quality, being darker and softer than plots 1, 2 and 3.
Plot No. 6. May 17........	do 23..	do 17..	Sept. 4..	3 to 3½	110	191	31	50	Stood up well and was well stooled; heads long and well filled; grain soft and dark.
Plot No. 7. May 24...........	June 2..	do 22.	do 7..	3	106	131½	21	55	Stood up well, but did not stool out as well as any of the others, and the grain was not so bright or hard.

CAMPBELL'S WHITE CHAFF—(Sown at the rate of 1½ bushels per acre.)

Date of Sowing.	Date of coming up.	Heading out.	Harvested	Length of Straw.	No. of days to ripen.	Weight of Grain.	Bushels per acre.		Remarks.
Plot No. 1. April 12.......	April 23..	June 24..	Aug. 12..	3 to 3½	122	150½	25	5	Heads good length and well filled out; grain plump and bright.
Plot No. 2. April 19..........	May 3..	July 1..	do 16..	3 to 3½	119	130	21	40	do do straw bright and stiff; did not stool well.

Plot No. 3. April 26	do 5..	do 6..	do 18..	3	114	108	18	00	Heads fair length and well filled, but thin on ground.
Plot No. 4. May 3........	do 12..	do 9..	do 22..	3 to 3½	110	170	28	20	Stood up well and was well stooled; heads long and well filled.
Plot No. 5. May 10....... ...	do 17..	do 14..	do 27..	3 to 3½	109	168	28	00	Straw soft and lodged; heads long and well filled.
Plot No. 6. May 17..........	do 23..	do 17.	do 30..	3 to 3½	105	163	27	10	Badly lodged; heads fair length.
Plot No. 7. May 24.....	June 2..	do 22..	Sept. 5..	3	104	106½	17	45	Very poor stand; did not stool; straw soft and crinkled down.

BARLEY, TWO-ROWED—PRIZE PROLIFIC—(Sown at the rate of two bushels per acre).

April 12	April 20..	June 29..	Aug. 6..	3 to 3¼	116	149½	31	7	Stood up well; did not stool well; heads long; no smut.
Plot No. 2. April 19	May 2..	July 1..	do 9..	3 to 3½	112	175¾	36	29½	Badly lodged but well stooled; heads long; grain plump and bright.
Plot No. 3. April 26	do 3..	do 4..	do 10..	3 to 3½	106	134	27	44	Lodged early and did not fill well; heads long; no smut.
Plot No. 4. May 3.....	do 10..	do 8..	do 17..	3½	106	188¼	39	10½	Stood up well and was well stooled; heads long and grain plump; no smut.
Plot No. 5. May 10.......	do 17..	do 13..	do 19..	3½	101	161¼	33	28½	Partly lodged; did not stool well; heads medium; no smut.
Plot No. 6. May 17..........	do 24..	do 16..	do 25..	3½	101	199	41	22	Crinkled down but well stooled; heads long; no smut.
Plot No. 7. May 24.....	June 2..	do 24..	Sept. 5..	3 to 3¼	104	168	35	00	Crinkled down; fairly well stooled, but not well headed; a little smut.

TESTS of Spring Wheat, Barley and Oats sown in plots one-tenth of an acre, in successive sowings of one week apart—*Continued.*

BARLEY, SIX-ROWED—BAXTER'S SIX-ROWED—(Sown at the rate of two bushels per acre).

Date of Sowing.	Date of Coming up.	Heading out.	Harvested	Length of Straw.	No. of Days to Ripen	Weight of Grain.	Bushels per Acre.		Remarks.
				Feet.		$\frac{1}{10}$ acre. Lbs.	Bush.	Lbs.	
Plot No. 1. April 12	April 20	June 22	July 29	$2\frac{1}{2}$ to 3	109	160	33	16	Heads long; grain plump and bright; straw thin, and did not stool well; no smut.
Plot No. 2. April 19	May 1	do 27	Aug. 1	$2\frac{1}{2}$ to 3	105	110	22	45	Stood up well, but was not well stooled; heads fair length; no smut.
Plot No. 3. April 26	do 3	do 29	do 3	$2\frac{1}{2}$ to 3	100	$128\frac{1}{2}$	26	37	Stood up well; fairly well stooled; heads medium; grain plump.
Plot No. 4. May 4	do 11	July 1	do 6	3	94	155	32	14	Stood up fairly well; very well stooled; grain plump; a little smut.
Plot No. 5. May 10	do 18	do 5	do 9	3 to $3\frac{1}{2}$	91	172	35	40	Stood up well; stooled very well; heads medium; grain plump.
Plot No. 6. May 17	do 23	do 11	do 16	$2\frac{1}{2}$ to 3	91	196	40	40	Straw short, but stooled well; heads long, and grain plump; very little smut.
Plot No. 7. May 24	do 30	do 15	do 22	$2\frac{1}{2}$ to 3	90	174	36	12	Straw short, and considerably crinkled down; heads good; no smut.

OATS—PRIZE CLUSTER—(Sown at the rate of $2\frac{1}{2}$ bushels per acre).

Date of Sowing.	Date of Coming up.	Heading out.	Harvested	Length of Straw.	No. of Days to Ripen	Weight of Grain.	Bush.	Lbs.	Remarks.
Plot No. 1. April 12	April 21	July 1	Aug. 8	4 to $4\frac{1}{2}$	119	128	37	22	Stood up well; grain bright and plump; no smut.
Plot No. 2. April 19	May 2	do 6	do 13	4 to $4\frac{1}{2}$	117	165	48	18	Straw strong; grain bright and plump; no smut.
Plot No. 3. April 26	do 6	do 9	do 18	3 to $3\frac{1}{2}$	115	132	38	28	Stood up well, but did not stool well; no smut.

Plot No. 4. May 3	do 14	do 13	do 19	$3\frac{1}{2}$	108	157	46	7	Stooled well, but straw soft and lodged.
Plot No. 5. May 10	do 19	do 16	do 22	$3\frac{1}{2}$	104	151	44	14	Straw soft and crinkled down; a little smut.
Plot No. 6. May 17	do 25	do 18	do 26	$3\frac{1}{4}$ to $3\frac{1}{2}$	101	175	51	16	Stooled well, but straw badly lodged; a little smut.
Plot No. 7. May 24	June 1	do 22	Sept. 3	$3\frac{1}{4}$ to 4	102	177	52	2	Stooled well; heads long; badly lodged.

OATS—BANNER—(Sown at the rate of $2\frac{1}{2}$ bushels per acre).

Plot No. 1. April 12	April 21	July 2	Aug. 13	$3\frac{1}{2}$ to 4	124	181	53	8	Straw stiff and fairly well stooled; grain bright and plump.
Plot No. 2. April 19	May 2	do 8	do 16	$3\frac{1}{2}$ to 4	120	177	52	2	Stood up well; grain bright and plump.
Plot No. 3. April 26	do 6	do 12	do 18	4	115	$193\frac{1}{2}$	56	31	Stood up well; grain bright and plump.
Plot No. 4. May 3	do 12	do 16	do 22	4	112	258	75	31	Stood up well; well stooled; grain bright and plump; very little smut.
Plot No. 5. May 10	do 19	do 18	do 27	4	110	273	80	10	Well stooled; long heads and well filled out; straw slightly lodged.
Plot No. 6. May 17	do 24	do 20	do 30	4	105	282	82	32	Well stooled; good heads; straw soft and lodged.
Plot No. 7. May 24	June 3	do 26	Sept. 5	4	104	$299\frac{1}{2}$	88	2	Well stooled; long and well filled heads; lodged.

FIELD PEASE.

Sown in plots of one-tenth of an acre, all sown at the same time, and under similar conditions, the soil and treatment being the same.

Varieties.	Amount Sown per Acre.	Date of Sowing.	Up.	Ripe.	Yield per Plot.	Yield per Acre.		Number of Days to Ripen.
	Bush.				Lbs.	Bush.	Lbs.	
Prince Albert........	2½	April 16..	May 2..	Aug. 25..	274	45	40	131
Mummy...	2½	do 16..	do 2..	do 22..	298	49	40	128
Prussian Blue............	2½	do 16..	do 3..	do 26..	126	21	00	132
Crown....................	2½	do 16..	do 3..	do 13..	179	29	50	119
Pride......	2½	do 16..	do 3..	do 17..	126½	21	5	123
Rennie's No. 10....	2½	do 16..	do 2..	do 27..	122½	20	25	133
White Marrowfat.........	3	do 16..	do 2..	do 11..	140	23	20	117

GARDEN PEASE.

One pound of garden pease of each of the following varieties were sown April 30th:—

Varieties.	Sown.	Up.	Fit for Table use.	Remarks.
Kentish Invicta	April 30..	May 14..	July 2..	Pods very short and not many on the vines.
Extra Early Star...........	do 30..	do 15..	June 30..	Pods good length, well filled, pea small.
Little Gem................	do 30..	do 14..	July 4..	Pods short but well filled.
Telephone.................	do 30..	do 15..	do 16..	Pods long and well filled, pea large.
Bliss' Abundance	do 30..	do 16..	do 21..	Pods medium.
Tom Thumb....	do 30..	do 24	do 6..	Long pods, well filled.
Early Kent................ .	do 30.	do 25..	do 7..	Pods medium in size, pea medium.
Blue Peter.	do 30..	do 16..	do 8..	Pods medium, not well filled.
First and Best..............	do 30..	do 17..	do 1..	Pods medium, well filled.
American Wonder..........	do 30..	do 17..	do 5..	do do
Horsfords..	do 30..	do 15..	do 16..	do do
Ringleader	do 30..	do 17..	do 10..	do do
Laxton's Alpha.............	do 30..	do 17..	do 5..	Peas very large and very fine flavoured, but pods only medium, not well filled.
Duke of Albany...	do 30..	do 17..	do 9..	Pods large, well filled with large peas of excellent quality.
Champion of England.........	do 30..	do 16..	do 20..	Pods medium in length, not well filled.
Extra Early.....	do 30..	do 15..	do 2..	Pods medium, well filled, quality poor.
Blue Imperial...............	do 30..	do 17..	do 22..	Pods long and well filled with large peas of good quality.
Extra Early Brittany........	do 30..	do 16..	do 7..	Pods short and not well filled.
Laxton's Surprise.......	do 30..	do 17..	do 18 .	Pods long, well filled with large peas of first quality.
Stratagem.	do 30..	do 16..	do 20..	Pods long and well filled, peas large and good.

TURNIPS.

Twelve varieties of turnips were tested, under similar conditions.

Two lots of each variety were sown, one on 3rd May, the other 14 days later—17th May.

The yield of the plots and the yield per acre is given below, both in bushels and tons.

Varieties.	Date of sowing.	Harvested	Yield per Plot.	Yield per Acre.		Yield per Acre.	
			Lbs.	Tons.	Lbs.	Bush.	Lbs.
Marquis of Lorne—							
Lot No. 1	May 3	Nov. 17	610	26	1,724	895	24
do 2	do 17	do 17	412	18	300	605	00
Carter's Elephant—							
Lot No. 1	do 3	do 17	709½	31	436	1,040	24
do 2	do 17	do 17	388½	17	188	569	48
Jumbo—							
Lot No. 1	do 3	do 17	544½	23	1,916	798	36
do 2	do 17	do 17	415	18	420	607	00
Prize Purple Top—							
Lot No. 1	do 3	do 17	433¼	19	126	635	26
do 2	do 17	do 17	289	12	1,432	423	52
Purple Top—							
Lot No. 1	do 3	do 17	462	20	556	675	56
do 2	do 17	do 17	310	13	1,280	454	40
Hartley's Bronze Top—							
Lot No. 1	do 3	do 17	404¾	17	1,601½	593	21½
do 2	do 17	do 17	199½	8	1,556	292	36
Elephant—							
Lot No. 1	do 3	do 17	688½	30	588	1,009	48
do 2	do 17	do 17	330	14	1,040	484	00
Mammoth Purple Top—							
Lot No. 1	do 3	do 17	499¼	21	1,934	732	14
do 2	do 17	do 17	335	14	1,480	491	20
Bangholm—							
Lot No. 1	do 3	do 17	462	20	656	677	36
do 2	do 17	do 17	336	14	1,590	493	10
Sutton's Champion—							
Lot No. 1	do 3	do 17	412½	18	300	605	00
do 2	do 17	do 17	337¼	14	1,678	494	38
Prize Winner—							
Lot No. 1	do 3	do 17	467	20	1,096	684	56
do 2	do 17	do 17	353¼	15	910	516	50
Bronze Top Extra—							
Lot No. 1	do 3	do 17	442¼	19	918	648	38
do 2	do 17	do 17	305⅜	13	900	448	20

These results corroborate those of last year, and point clearly to the advantage of the early sowing of field turnips in this climate.

Mangels.

Twelve varieties of Mangels were sown in two plots each. One of each variety was sown on 2nd May and the second sowing was on 16th May.

Varieties.	Sown.	Up.	Yield per Plot.	Yield per Acre.		Yield per Acre.	
			Lbs.	Tons.	Lbs.	Bush.	Lbs.
Red Globe—							
Lot No. 1	May 2	May 13	266½	11	1,452	390	51
Lot No. 2	do 16	do 27	140¼	6	321	205	20
Mammoth Long Red—							
Lot No. 1	do 2	do 13	336¾	14	1,634	493	54
Lot No. 2	do 16	do 26	203¾	8	1,930	298	50
Mammoth Long Red—							
Lot No. 1	do 2	do 13	359¼	15	1,614	526	54
Lot No. 2	do 16	do 28	162¾	7	322	238	42
Red Fleshed Tankard—							
Lot No. 1	do 2	do 14	328½	14	908	481	48
Lot No. 2	do 16	do 27	202¼	8	1,798	296	38
Red Globe—							
Lot No. 1	do 2	do 15	296½	13	92	434	52
Lot No. 2	do 16	do 28	215½	9	964	316	04
Berkshire Prize—							
Lot No. 1	do 2	do 14	223¾	9	1,690	328	10
Lot No. 2	do 16	do 26	157¾	6	1,882	231	22
Mammoth Long Red—							
Lot No. 1	do 2	do 13	327	14	776	479	36
Lot No. 2	do 16	do 28	181	7	1,928	265	28
Giant Yellow Intermediate—							
Lot No. 1	do 2	do 14	256¾	11	594	376	14
Lot No. 2	do 16	do 26	176	7	1,488	258	8
Carter's Warden—							
Lot No. 1	do 2	do 14	292½	12	1,740	429	..
Lot No. 2	do 16	do 27	185½	8	324	272	4
Canadian Giant—							
Lot No. 1	do 2	do 15	270¾	11	1,826	397	6
Lot No. 2	do 16	do 28	148¼	6	1,046	217	26
Yellow Globe—							
Lot No. 1	do 2	do 15	160¾	7	146	235	46
Lot No. 2	do 16	do 26	151¾	6	1,354	222	46
Golden Fleshed Tankard—							
Lot No. 1	do 2	do 14	261	11	968	382	48
Lot No. 2	do 16	do 27	250	11	.....	386	40

The yield of a similar series of plots of Mangels in 1891 was very much larger than in the above, running from 31 to 69 tons per acre, but they were sown earlier—on the 9th and 23rd of April. A few plots sown from the 8th to the 25th of May did almost equally well, showing that the season of 1892 has been unfavourable for this crop.

CARROTS.

Twelve varieties of carrots were tested in the same way, and under similar conditions as the turnips. The first sowing was on 30th April, the second on 14th May. Soil and treatment the same in each case.

Varieties.	Date of Sowing.	Harvested.	Yield per Plot.	Yield per Acre. Tons.	Lbs.	Yield per Acre. Bush.	Lbs.
Early Gem—							
Lot No. 1	April 30	Nov. 18	218½	9	1228	320	28
Lot No. 2	May 14	do 18	206¾	9	194	303	14
Chantenay—							
Lot No. 1	April 30	do 18	296¼	13	114	435	14
Lot No. 2	May 14	do 18	240	10	1120	352	00
White Intermediate—							
Lot No. 1	April 30	do 18	394½	17	716	578	36
Lot No. 2	May 14	do 18	224	9	1712	328	52
Half Long—							
No. 1	April 30	do 18	308¾	13	1170	452	50
No. 2	May 14	do 18	286¾	12	1034	417	14
Guerande—							
Lot No. 1	April 30	do 18	327	14	776	479	36
Lot No. 2	May 14	do 18	272¾	12	42	400	42
Orange Giant—							
Lot No. 1	April 30	do 18	272¼	11	1958	399	18
Lot No. 2	May 14	do 18	159	6	1992	233	12
Improved Short White—							
Lot No. 1	April 30	do 18	352¾	15	1042	517	22
Lot No. 2	May 14	do 18	223¼	10	538	340	38
Mammoth Intermediate Smooth White—							
Lot No. 1	April 30	do 18	365¼	16	102	535	2
Lot No. 2	May 14	do 18	218¾	9	1270	321	10
Danvers—							
Lot No. 1	April 30	do 18	262½	11	1100	385	00
Lot No. 2	May 14	do 18	157½	6	1860	231	00
Iverson's Champion—							
Lot No. 1	April 30	do 18	250¾	11	66	367	46
Lot No. 2	May 14	do 18	152½	6	1420	223	40
Vosges—							
Lot No. 1	April 30	do 18	217¾	9	1162	319	22
Lot No. 2	May 14	do 18	137¼	6	78	201	18
Large White Belgian—							
Lot No. 1	April 30	do 18	246½	10	1692	361	32
Lot No. 2	May 14	do 18	171¾	7	1114	251	54

These results, like those of 1891, show the advantage of early sowing.

Sugar Beets.

Four varieties of sugar beets were sown alongside of each other in rows 30 inches apart, and treated alike. The crowns of the roots were kept covered with earth during the period of growth. None of the roots were larger than four lbs. They yielded as follows :—

Varieties.	Sown.	Up.	Harvested.	Yield per Plot.	Yield per Acre.		Yield per Acre.	
					Tons.	Lbs.	Bush.	Lbs.
Vilmorins' Improved.	May 19.....	May 31.....	Dec. 5... ..	218½ lbs...	9	1,228	320	28
Klein Wanzleben...........	May 19.....	May 31.....	Dec. 5......	90 lbs.....	3	1,920	99	00
Brabant................. .	May 19.....	May 31.....	Dec. 5......	150 lbs....	6	1,200	220	00
Kruger	May 19.....	May 31.....	Dec. 5......	137 lbs....	6	56	201	56

Potatoes.

Twenty-two varieties were tested, to find what effect spraying with Bordeaux Mixture would have in preventing the blight of the tops and rotting of the tubers.

They were planted in rows three ft. apart, and the sets, one ft. in the row. The sets were cut to two strong eyes, and the vines were sprayed twice, July 19th and 28th. As the ground had been ploughed for the first time in August of the previous year, the yield was not large in any case, but I think the results given show that this year, although there was no rot, yet spraying arrested the blighting in the tops, and by so doing increased the yield.

Varieties.	Planted.	Up.	Dug.	Marketable. Sprayed.	Not Marketable. Sprayed.	Total.	Marketable. Not Sprayed.	Not Marketable. Not Sprayed.	Total.	Yield per Acre Sprayed.		Yield per Acre Not Sprayed.	
				Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Bush.	Lbs.	Bush.	Lbs.
Empire State..........	May 23.	June 16.	Oct. 11.	40	15	55	53	13	66	134	26	166	13
Ohio Gunner....	do 23.	do 16.	do 11.	16	20	36	18	21	39	88	00	95	20
Ohio Junior..... .. .	do 23.	do 16.	do 11.	24	14	38	22	16	38	92	54	92	54
Chicago Market......	do 23.	do 16.	do 11.	39	11	50	28	11	39	122	13	95	20
Brownell's Winner. ...	do 23.	do 16.	do 11.	28	18	46	20	14	34	112	26	83	16
Clarke's No. 1.........	do 23.	do 17.	do 11.	36	16	52	32	12	44	127	6	107	32
Delaware..	do 23.	do 17.	do 11.	38	13	51	32	17	49	124	40	119	46
Algoma No. 1.........	do 23.	do 17.	do 11.	29	13	42	15	7	22	102	40	53	46
Early Puritan.........	do 23.	do 16.	do 11.	31	9	40	32	9	41	97	46	100	12
Rose's New Giant......	do 23.	do 17.	do 11.	33	5	38	21	6	27	92	53	66	00
Early Maine	do 24.	do 17.	do 11.	23	12	35	21	12	33	85	33	80	40
Lee's Favourite........	do 24.	do 16.	do 11.	21	20	41	24	19	43	100	12	105	6
Vanguard	do 24.	do 16.	do 12.	16	13	29	15	7	22	70	53	53	46
White Star............	do 24.	do 18.	do 12.	16	19	35	15	16	31	85	33	75	46
Rochester Favourite...	do 24.	do 17.	do 12.	17	18	35	18	19	37	85	33	90	26
Green Mountain..	do 24.	do 18.	do 12.	15	18	33	17	12	29	80	40	70	53
London	do 24.	do 18.	do 12.	21	21	42	10	12	22	102	40	53	46
Thorburn,.	do 24.	do 18.	do 12.	19	11	30	14	6	20	73	20	48	53
Early Eating..........	do 24.	do 17.	do 12	12	5	17	11	5	16	41	33	39	6
Halton Seedling... ..	do 24.	do 18.	do 12.	14	16	30	14	13	27	73	20	66	00
Early Rose...........	do 24.	do 17.	do 12.	14	15	29	15	10	25	70	53	61	6
Rural Blush.	do 24.	do 19.	do 12.	13	15	28	12	13	25	68	26	61	6

A series of plots of potatoes were also planted, beginning March 25th and continued at intervals of one week until June 3rd, to test the merits of cut versus whole seed, and early and late planting.

The rows were planted three feet apart, and one foot apart in the rows. The sets were cut to two strong eyes, and the whole potatoes would average about three sets if cut.

The land had been in cultivation for some time, and had received a light dressing of stable manure for the previous crop of mangels.

Planted.	Up.	Yield per Acre.	Seed.
		bush. lbs	
March 25	April 18	220 13	Cut sets.
do 25	do 15	283 8	Whole potatoes.
April 1	do 22	283 18	Cut sets.
do 1	do 22	338 48	Whole potatoes.
do 8	do 26	237 10	Cut sets.
do 8	do 25	312 11	Whole potatoes.
do 15	do 29	316 20	Cut sets.
do 15	do 29	338 39	Whole potatoes.
do 22	May 6	316 18	Cut sets.
do 22	do 6	333 57	Whole potatoes.
do 29	do 14	280 43	Cut sets.
do 29	do 14	396 53	Whole potatoes.
May 6	do 18	205 42	Cut sets.
do 6	do 18	281 20	Whole potatoes.
do 13	do 24	256 31	Cut sets.
do 13	do 24	290 24	Whole potatoes.
do 20	do 30	171 49	Cut sets.
do 20	do 30	343 38	Whole potatoes.
do 27	June 8	212 57½	Cut sets.
do 27	do 8	244 25	Whole potatoes.
June 3	do 18	106 29	Cut sets.
do 3	do 18	154 53	Whole potatoes.

Fodder Plants.

A small quantity of the seed of the following fodder plants was received from the Central Experimental Farm, and sown 26th May to 4th June. As there was only a small quantity of each, they were allowed to ripen for the seed.

Varieties.	Sown.	Up.	Length of Straw.	Length of Heads.	Remarks.
			Feet.	Inches.	
Hungarian Grass	May 26.	June 9.	4	2 to 4	Did not stool; cut Sept. 10.
Chana Millet	do 26.	do 11.	4 to 4½	6 to 10	Did not stool freely; ripe Sept. 30.
Branching Millet	do 26.	do 12.	4 to 5	4 to 8	Stooled well, had a great deal of foliage; promises to be desirable for fodder; ripe Sept. 30.
Long-Headed Millet	do 26.	do 13.	5	5 to 10	A heavy crop; should be a desirable fodder plant; ripe Sept. 14.
Canary seed	do 27.	do 12.	4½	½ to 2	Stalks slender and bare; ripe Sept. 10.
Red Millet	do 27.	do 14.	4 to 4½	4½ to 6	Did not stool freely, but well furnished with foliage; ripe Sept 14.
Italian Millet	do 27.	do 8.	4½ to 5	5 to 8	Did not stool; a light crop; ripe Sept. 14.
Black Millet	June 3.	do 12.	4	4 to 6	Not a heavy cropper; heads very thin; ripe Sept. 4.
Choice Round White Millet	do 4.	do 13.	5	7 to 9	Did not stool; only a light crop; ripe Sept. 14.
Round White Millet	do 4.	do 11.	5	6 to 10	Stooled fairly well; ripe Sept. 5.
Californian Green Millet	do 4.	do 12.	3 to 3½	2 to 3	Stalks slender and bare; a poor crop; Sept. 7

Lathyrus Sylvestris Wagneri.

This plant has made a vigorous growth again this year, and as there has been considerable inquiry for seed, we let it ripen, so that there might be a quantity of seed for distribution.

The seed raised last year was distributed in small quantities throughout the dry grazing lands of the interior, and as far east as Calgary in the North-west Territories.

A small quantity of the seed was sown on the farm in April, it came up, but has only made a growth of about 10 inches.

Reports have been received from two parties in the Territories, to whom were given a few seeds, Mr. W. Pearce and Mr. Oscar Moorehouse, both of Calgary, and in each case a growth of from 6 to 10 inches was made.

Summer Fallow.

The piece of new land summer-fallowed last year, to kill the ferns, has been a fair success, very few ferns showing this year, and I believe if thoroughly done, and followed by a hoed crop, that the ferns would give very little after trouble.

Cross-Fertilizing and Hybridizing.

Early in July, Mr. A. P. Saunders paid the farm a visit for the purpose of doing some cross-fertilizing and hybridizing. Crosses were attempted between eleven varieties of fall and spring wheats, covering twenty-three heads; also between twelve different varieties of peas. Efforts were also made to hybridize the wild and cultivated vetch, blue lupin and Lathyrus sylvestris with the cultivated pea, twenty-nine blossoms being operated on.

The endeavour was made to cross four varieties of oats, covering seven heads; also six varieties of barley covering eight heads.

Quite a number of these have been successful, and the produce will be carefully sown and cared for next year, in the hope that something of merit may result.

Hedge.

About 500 yards of one year old osage orange plants were set out along the north fence for a hedge. They have made a fair growth, and will show in a few years whether osage orange is suitable for fencing in this climate.

Shelter Belt.

A shelter belt, 50 yards wide and 25 chains long, of mixed forest trees, such as ash, maple, white pine, &c., was planted along the north fence. The trees are growing well and will soon make quite a showing.

Distribution of Grain and Potatoes.

A large number of samples of seed grain and potatoes were distributed from the farm last year among the farmers of this province, but up to the present time no reports have been received as to their success.

Fish Guano.

A ton of fish guano was purchased from one of the canneries in the spring, and tested on peas, oats, wheat and different kinds of root crops in quantities varying from 100 to 400 lbs. per acre, and the produce weighed.

The plots will be sown or planted with the same varieties next year, to ascertain what effect the fertilizer has, and if it is lasting, but it will require a series of tests to satisfactorily determine whether it will pay to use it at the present price of $25 per ton.

STRAWBERRIES.

The spring frosts injured the crop of strawberries to a considerable extent, but several varieties gave very fair returns.

Quite a number of the varieties tested are not worth keeping, some, on account of feeble growth and unproductiveness, others on account of the poor quality of the fruit.

The following, are the notes taken this year.

Varieties.	Fruit ripe.	Remarks.
1. Bubach	June 10.	Berry large to very large, and borne on very long stems, well up from the ground; good for home use, or for shipping; plants vigorous and prolific, carries size of berries to end of season.
2. Sharpless	do 10..	Berries large to very large, irregular in shape; flavour good; productive, stem long and strong, a vigorous healthy grower.
3. Wilson	do 11..	Berries medium in size, firm and regular in shape; prolific; plant vigorous and healthy.
4. Black Giant	do 12..	Berry large and regular in shape, moderately firm; quality fair; plant vigorous, healthy and productive.
5. Cumberland Triumph	do 9..	Berry medium in size; productive, a good home berry.
6. Gandy	do 10..	Berry good size colour and shape; flavour good; prolific, stem long and holds fruit well up; vigorous grower, foliage healthy, one of the best.
7. Maggie	do 5..	Berry medium and even in size; prolific; carries size to the last of the season; inclined to be soft, stem very short.
8. Prince of Berries	do 14..	Berry bright red, firm and prolific; a good many imperfect berries; vigorous healthy grower.
9. Pineapple	do 12..	Berry above medium in size, long and irregular, does not ripen out to the tip.
10. Belmont	do 6..	Berry long and large, poor flavour, and soft; prolific; a vigorous grower, but does not ripen to tips.
11. Bordelaise	do 19..	Berry small and imperfect, too dark in colour; poor cropper, not desirable.
11. Capt. Jack	do 10..	Berry small and soft; poor flavour; not prolific; foliage rusty; a feeble grower.
13. Norman	do 9..	Berry very irregular in size, ranging from very small to large; too soft to ship; very feeble grower not desirable.
14. Itasca	do 5..	Berry medium to small, soft; foliage rusty.
15 May King	do 12..	Berry medium to small in size, good colour and shape, inclined to be soft, not very prolific; plant vigorous and healthy.
16. Hathaway	do 10..	Berry uneven in size and bad shape, inclined to be soft; not very prolific; not desirable.
17. Seneca	do 11..	Berry medium in size, a large per cent imperfect, and runs to very small late in the season.
18. Manchester	do 10..	Berry medium in size, firm, good shape and appearance; only moderately prolific.
19. James Vick	do 18..	Plant a strong, vigorous grower; foliage healthy; productive; berry very small.
20. Woodruff	do 13..	Berry medium to small, poor shape; foliage rusts badly.
21. Jumbo	do 7..	Berry irregular in size, running from small to very large; prolific and firm; stem short; foliage healthy and plant vigorous.
22. Emerald	do 10..	Berry small and many imperfect; foliage rusty.
23. Chas. Downing	do 13..	Berry good size and shape; fairly prolific; plant vigorous, but foliage very rusty.
24. Photo	do 13..	Berry large and firm; plant vigorous and healthy, but not prolific.
25. Windsor	do 11..	Berry medium in size and firm; carries size to end of season; not prolific; plant vigorous and healthy.
26. Atlantic	do 13..	Berry uneven in size and irregular in shape; too soft to ship well; a weak grower and foliage rusty; not prolific.
27. Wonderful	do 9..	Berry above medium in size, good shape and borne on long stems; a good shipper; plant vigorous and healthy; very prolific, and berries maintain their size to end of season.
28. Mrs. Garfield	do 10..	Berry large and fine looking, but soft; plant a feeble grower, and not productive.
29. Jersey Queen	do 13..	Berry small to medium, and many imperfect, soft and poor in quality plant vigorous; foliage healthy; not a good cropper.
30. Mary Fletcher	do 9..	Berry large and good shape, of good flavour, but too soft for shipping plant vigorous and healthy; only moderately productive.
31. Crescent	do 14..	Berry small and poor; not desirable.
32. Old Ironclad	do 12..	Berry very small and poor in quality; plant vigorous and healthy but not productive.
33. Osceola	do 9..	Berry very small and poor; not worth keeping.

STRAWBERRIES—*Concluded.*

Varieties.	Fruit ripe.	Remarks.
34. Connecticut Queen...	June 16..	Berry large to medium; too soft to ship well; plant vigorous and moderately prolific.
35. Warfield, No. 2......	do 8..	Berry medium to very small, sour and soft; plant moderately vigorous, and foliage healthy; not prolific.
36. New Dominion......	do 10..	Berry very uneven in size; quality fair, a little soft; plant only moderately vigorous; foliage rusty; not very productive.
37. Jessie.........	do 9..	Berry medium to large, firm and of good appearance; plant vigorous; foliage healthy; berries borne on long stems; productive.

RASPBERRIES.

Varieties.	Ripe.	Remarks.
Cuthbert...............	June 27..	Berries very fine and a good cropper; canes vigorous.
Marlboro...............	do 21..	Berry fair size and fine looking, liable to drop off as soon as ripe.
Turner.................	July 2..	Too small for profit.
Caroline...	June 23..	Very small and poor.
Brandywine	do 25..	Very small, canes slender and feeble.
Heebner................	do 29..	Medium in size but very soft.
Hansell....	July 8..	A very poor berry; too small and not productive.
Golden Queen...........	June 27..	Berry of good size and fine appearance; flavour fine; not very productive

Saunders' Seedlings.

3-13..	July 3..	Berry fair size; uneven; not productive.
3-7....	June 27..	Size, small to large; soft, not a good stripper; flavour very fine.
3-11 yellow............	do 26.	Fine large berry, good flavour and productive; plant vigorous, but too soft for shipping.
3-39...................	do 30..	Berry large; very productive; flesh firm; plant vigorous.
4-38..	July 9..	Berry large, even in size, firm and productive; one of the best.
3-74...................	June 28..	Berry medium to very large; firm, good shape and flavour; productive.
8-72.......	do 24..	Berry too small and imperfect; not desirable, as it comes to pieces in picking.

BLACKBERRIES.

Only three varieties, which were planted in the spring of 1890, have fruited:—

Varieties.	Ripe.	Remarks.
Snyder.......	July 21..	Productive, and good quality.
Agawam................	do 20..	Good size, and very productive.
Taylor's Prolific.........	do 22..	Good size, prolific, and fair quality.

CURRANTS.

Several varieties each of the red, white and black currants fruited this year.

As the bushes are young the yield was very light, but as they made a healthy growth, there is every promise of a better return next year.

Gooseberries.

Five each, of the following varieties were received from England last spring:—

Leader, Bonny Lass, Ladnes Lady, Warrington, King of Trumps, Telegraph, Duckwing, Westbandman and Pilot.

The season was well advanced when they arrived, and only a few of them made any growth.

Several of those planted in the spring of 1890 gave a few berries.

Lucretia Dewberries.

These fruited this year. I do not think that they have any good qualities to recommend them.

The fruit was very irregular in size, and many berries imperfect, and the flavour was poor.

Apples.

The apple trees have made a uniformly healthy vigorous growth.

The following varieties produced from one to half a dozen apples each:—

Alexander,
American Golden Russet,
Bombshell,
Canada Red,
Colvert,
Duchess of Oldenburg,
Fameuse,
Early Harvest,
Grimes Golden,
Haas,
Hurlburt,
Jersey Sweet,
Keswick Codlin,
Longfield,
Maiden's Blush,
Oregon Red Cheek,
Ribston Pippin,
Rolfe,
Seek no Further,
Scott's Winter,
Smith's Cider,
Tetofsky
Wellington,
Wealthy,
Yellow Siberian,
McMahon's White,
General Grant,
Hyslop.

Pears.

A few of the pear trees blossomed last spring, but only the Keiffer fruited.

We had several pears of that variety both on the standard and dwarf trees.

There have been no losses among the pear trees, and all have made a very fine growth.

Plums.

All the plum trees have made a very fine growth.

Several of the earlier varieties were caught by the late spring frost and the fruit killed.

The following varieties fruited:—

Damson, ripe 10th September.
Reine Claude, ripe 20th September, fruit burst on tree.
Lombard, ripe 10th September.
Coe's Golden Drop, ripe 24th September.
Bleeker's Gage, ripe 28th September.
Saunders, ripe 16th August.
Moore's Arctic, ripe 30th August.
Gueii, ripe 5th September.
Duane's Purple, ripe 9th September
Peach Plum, ripe 28th August.
Pond's Seedling, ripe 9th September.
Red Egg, ripe 5th September.
Prune d'Agen, ripe 20th September.
German Prune, ripe 25th September, fruit badly burst.
Munro, ripe 10th September.

Apricots.

The apricot trees have all lived, and they have made a very healthy growth, but owing to the spring frosts have not given any fruit this year.

Nectarines.

The curl leaf affected the nectarine trees so badly in May and June, that two trees died, viz., one Pitmaston's Orange and one Early Violet. The other trees of these varieties and the Victoria made a feeble growth until July. Since then they have made a fair growth. The Early Violet was one of those that escaped curl leaf altogether last year.

All the other varieties made a vigorous growth, and if no spring frosts occur next year they will no doubt give a crop of fruit.

Peaches.

The spring frosts cut off the crop of peaches, and the injury by frost was followed by a severe attack of curl leaf.

Only five varieties of those planted in the valley escaped curl leaf, viz., Early Crawford, Malta, Foster, Wager and Surpasse Melocoton. These, although planted alongside, and the soil and treatment the same, were not affected.

Some trees which made a most vigorous growth in 1890 and 1891 suffered the most injury this year, having made scarcely any new growth. The trees planted on the bench lands, did not suffer so much, and appeared to recover much more rapidly than those in the valley. None of the trees have died, and perhaps they will recover lost ground next year.

Cherries.

The cherry trees have made a vigorous growth and the following varieties fruited :—

Early Purple Guigne, ripe 15th June.
Parent, ripe 9th July, fruit small.
Black Heart, ripe 18th June, fruit split very badly.
Cumberland, ripe 24th June, fruit very fine and large.
Lieb, ripe 18th June, fruit medium size.
English Morello, ripe 15th July.

Bench Orchards.

Since my last report, two orchards of mixed fruits, viz. : apples, pears, plums, peaches and nectarines, have been set out on the bench land.

One orchard of 241 trees at an altitude of from 245 feet at the lowest point, to 410 at the highest ; and one of 93 trees, ranging from 725 feet at the lowest point to 825 feet at the highest point above the orchards on the level land of the farm.

The soil on these benches is a warm loam, and judging from the growth made by the trees planted, is well adapted for fruit trees, and is considerably earlier than in the valley, and will no doubt be less liable to late frosts in the spring.

These orchards together with those previously planted on the first bench in the spring of 1890 make a total planted on the benches of 473 trees of apple, pear, peach, plum, cherry, nectarine and apricot, and with very few exceptions they have made a satisfactory growth.

About 30 grape vines have been added to those planted on the bench in the spring of 1890, and although none have yet fruited they have made a strong growth, and coming into leaf earlier in spring, will likely ripen their fruit earlier than the same varieties on the level land.

Grapes.

The following varieties of grapes fruited this year, but owing to the autumn being very wet, only six varieties ripened.

Jessica, ripe 15th October.	Brighton, did not ripen.
Florence, ripe 18th October.	Worden "

Wyoming, ripe 20th October.		Herbert,	did not ripen.
Champion, ripe 14th October.		Empire State	"
Eldorado, ripe 22nd October.		Rogers No. 39	"
Buchanan, ripe 28 October.		Bacchus	"
Concord,	did not ripen.	Wonder	"
Delaware	"	Arnold's No. 8	"
Wilder	"	Secretary	"
Amber Queen	"	Eva	"
Moore's Early	"	Noah	"
Martha	"	Marion	"
Niagara	"	Arnold's No. 1	"
Hartford	"	Cottage	"
Massasoit	"	Roger's No. 19	"
August Giant	"	Highland	"
Rogers No. 28	"	Missouri	"
Agawam	"	Roger's No. 24	"
Salem	"	Jefferson	"
Lindley	"		

All have made a very vigorous growth.

Figs.

The fig trees have all made a very strong growth this year. None of them were injured by the cold last winter. The Col de Signora Bianca and Early Violet fruited, but the figs did not come to maturity.

Quinces.

The quince trees have all made a good growth and blossomed last spring, but were injured by the late spring frost and did not fruit.

Nut-bearing Trees.

English and Dwarf English, Japanese and American Walnuts.
Hard and soft-shell and Languedoc Almonds.
Butternuts.
American, Spanish, Japanese Giant, and Hathaway Chestnuts.
Kentish Cob, Cosford and Corylus Avellana Filberts.
Shell-bark Hickory.
Pecans—six varieties.

All these, with the exception of the Pecans, have done remarkably well, the Corylus Avellana having begun bearing.

The consignment of Japanese fruit and ornamental trees, shrubs and climbing plants, received last spring, have all lived and made a healthy growth, as have all the trees and shrubs received from the Central Experimental Farm and other sources since the planting was begun on this farm.

Our collection of fruit and nut-bearing trees, vines, &c., which are now on the farm living and in healthy condition, embraces the following :—

	Varieties.
Apples	215
Pears	63
Plums	74
Peaches	118
Apricots	20
Nectarines	12
Cherries	55
Quinces	7
Figs	12
June berries	1

Fruit and nut-bearing trees, &c.—*Con.*

	Varieties.
Orange	1
Mulberries	4
Grapes	101
Strawberries	73
Blackberries	27
Raspberries	36
Currants	49
Gooseberries	18
Pomegranate	1
	887

Of the 49 varieties of currants, 32 are Saunders' seedlings.

Nut-bearing Trees.

Walnuts	4
Almonds	3
Butternuts	1
Chestnuts	4
Filberts	3
Hickory	1
	16
Grand total	903

Weather Record for 1892.

Giving the date of the highest and lowest temperature, the rain and snow, and the number of days entirely overcast and hours of sunshine in each month, from January 1st to December 15th, inclusive.

Months.	Date of Lowest Temperature.		Date of Highest Temperature.		Rain.	Snow.	Days Entirely Overcast.	Hours of Sunshine.	
		°		°	Inches.			Hrs.	Min.
January	10th	7	25th	57	6·57	$2\frac{1}{2}$	13	55	45
February	19th	28	24th	61	3·27	...	8	75	37
March	31st	31	15th	74	6·01	29th—1	10	75	39
April	7th	30	20th	77	4·04	...	9	80	27
May	6th	37	21st	79	5·73	...	7	156	15
June	5th	44	27-28th	90	3·16	...	5	191	42
July	6th	38	27th	90	3·27	...	7	181	24
August	4th	46	19th	90	2·78	...	1	208	30
September	21st	43	12th	90	6·94	...	7	119	03
October	16th	23	3rd	79	5·99	...	9	121	54
November	25-26th	16	4th	56	14·94	$4\frac{1}{2}$	24	4	45
December, 1st to 15th	10th	24	12th	43	2·26	2	10	18	27
					$64\frac{96}{100}$	10			

LIVE STOCK.

Since my last report, the following has been added to our stock :

Shorthorns.

One young bull, bought at Bow Park, Ontario.

Holsteins.

One Holstein cow, bought of Mr. A. C. Hallman, New Dundee, Ont., and a heifer and bull bred at the Central Experimental Farm.

Ayrshires.

Two Ayrshire cows, one heifer and a heifer calf, and one bull and a bullcalf, from the Experimental Farm at Indian Head, and one bull calf from the Central Experimental Farm. Since coming here, one of the Ayrshire cows has dropped twins—a bull and a heifer.

Sheep.

Two Dorset horned sheep and a ram, bought from Mr. T. W. Hector, Port Credit, Ont.

Pigs.

One Berkshire boar, and three Improved Large Yorkshire sows and a boar, bred at the Central Experimental Farm.

All these were brought to the farm in October, the only loss was one sow, which died on the way. The others are doing well in their new quarters.

The two shorthorn cows reported on last year, had each a calf last spring, a bull and a heifer. All of the shorthorn stock did very well last year.

Poultry.

In June we received from the Central Experimental Farm a setting of Langshan and Golden Poland eggs. We also brought through with the car of live stock a trio each of Light Brahmas and Dorkings. These have been added to the four breeds, Houdans, Wyandottes, Black Spanish, and White Leghorns previously had.

The present poultry house is only a temporary building, and does not afford the accommodation needed for testing the merits of the different breeds. It is hoped the accommodation required will be provided in time for the breeding season.

Stallion.

The stallion sent to the farm by the Haras National Co., was a very fine Clyde. He only got 11 mares, but there are not a large number in this valley and there are two other stallions here.

During 1892 a very commodious barn for our work has been built, on the farm which has been of great benefit in enabling us to save the crops successfully during the rather catching weather, which prevailed here during the latter part of harvest.

Visitors.

There has been a great many more visitors at the farm this year than ever before, including a number of farmers residing in British Columbia as well as many visitors from distant points.

I have the honour to be, sir,

Your obedient servant

THOS. A. SHARPE.

STATEMENT of Expenditure on the Dominion Experimental Farms, for the Year ending 30th June, 1892.

CENTRAL EXPERIMENTAL FARM.

EXPENDITURES, 1st July, 1891, to 30th June, 1892.

	$ cts.
Cattle	1,293 75
Feed for stock, including experimental feeding of steers and swine; also veterinary services	1,684 47
Seed grain, trees, shrubs, &c	1,220 32
Implements, tools, hardware and supplies	931 43
Draining and drain tiles	244 50
Manure and fertilizers, including wages of teamsters drawing manure from city during winter.	1,517 38
Travelling expenses	428 66
Exhibition expenses	674 39
Blacksmithing, repairs to wagons, vehicles, &c.; also harness supplies and repairs	478 69
Books, periodicals and newspapers	235 85
Telegrams and telephones	158 14
Wages, farm work, including experimental work with grain and other farm crops; also salaries of farm foreman and director's assistant in experimental work	5,741 43
Wages, care of stock, including experiments in feeding cattle and swine	2,080 03
do horticultural department, including salary of horticulturist	2,784 54
Poultry department, including salary of poultry manager	1,061 16
Care of forest plantations, grounds and shrubbery	684 15
Dairy department	802 15
Extension of water pipes to dairy building and piggery	250 66
Contingencies, including building sidewalks, $147.45	376 02
	22,647 72

EXPERIMENTAL FARM, MARITIME PROVINCES.

EXPENDITURES, 1st July, 1891, to 30th June, 1892.

	$ cts.
Cattle and other stock	873 75
Feed for stock and veterinary services	92 19
Seed grain, trees, shrubs, &c	48 61
Implements, tools, hardware and supplies	482 70
Draining and drain tiles	669 06
Manure and fertilizers	288 49
Travelling expenses	67 23
Exhibition expenses	85 33
Blacksmithing and repairs	104 31
Salaries	1,400 00
Wages, farm work, including experimental work with farm crops, fruit trees, vines, &c	1,473 67
do care of stock	755 34
do office help	120 00
Contingencies	63 28
	6,523 96

EXPERIMENTAL FARM, MANITOBA.

EXPENDITURES, 1st July, 1891, to 30th June, 1892.

	$ cts.
Cattle and other stock	2,392 74
Feed for stock and veterinary services	188 51
Seed grain, trees, shrubs, &c	290 75
Implements, tools, hardware and supplies	906 25
Draining and drain tiles	33 71
Manure and fertilizers	158 35
Travelling expenses	148 10
Exhibition expenses	535 14
Blacksmithing and repairs	248 59
Telegrams and telephones	49 66
Distribution of seed grain and forest trees	211 37
Salaries	1,400 00
Wages, farm work, including experimental work with farm crops, fruit trees, vines, &c	4,005 02
do care of stock	643 91
do forestry, tree planting	162 00
do office help and mail messenger	162 67
Digging wells and supplying pumps	155 78
Contingencies	219 10
	11,911 65

EXPERIMENTAL FARM, NORTH-WEST TERRITORIES.

EXPENDITURES, 1st July, 1891, to 30th June, 1892.

	$ cts.
Feed for stock and veterinary services	341 59
Seed grain, trees, shrubs, &c	159 66
Implements, tools, hardware and supplies	788 89
Manure and fertilizers	352 59
Travelling expenses	217 95
Exhibition expenses	168 15
Blacksmithing and repairs	219 33
Distribution of seed grain and forest trees	21 85
Salaries	1,400 00
Wages, farm work, including experimental work with farm crops, fruit trees, vines, &c	4,207 02
do care of stock	1,106 75
do forestry, tree planting	292 50
do office help	70 00
Contingencies	236 77
	9,583 05

EXPERIMENTAL FARM, BRITISH COLUMBIA.

EXPENDITURES, 1st July, 1891, to 30th June, 1892.

	$ cts.
Cattle	45 00
Feed for stock and veterinary services	593 43
Seed grain, trees, shrubs, &c	228 13
Implements, tools, hardware and supplies	421 43
Manure and fertilizers	17 26
Travelling expenses	115 15
Exhibition expenses	100 15
Blacksmithing and repairs	60 07
Salaries	1,200 00
Wages, farm work, including experimental work with farm crops, fruit trees, vines, &c	2,470 02
do clearing land, stumping, &c	1,738 56
do office help	150 00
Contingencies	180 48
	7,319 68

SUMMARY.

TOTAL Expenditure for Experimental Farms, 1891-92.

	$ cts.
Central Experimental Farm, Ottawa	22,647 72
Experimental Farm for Maritime Provinces, Nappan, N.S.	6,523 96
do Manitoba, Brandon	11,911 65
do North-west Territories, Indian Head	9,583 05
do British Columbia, Agassiz	7,319 68
General Expenses.	
Printing and stationery	1,639 01
Seed grain distribution	2,474 30
Forest tree distribution	669 50
Salaries	4,000 00
Chemical department, including salaries of chemist and assistant chemist	2,554 08
Entomological and botanical department, including salaries of entomologist and botanist and assistant	2,043 91
Office help, distribution of reports and bulletins, including salaries of accountant, director's secretary and French correspondents	3,025 61
Testing the vitality of agricultural seeds, &c	607 53
	75,000 00

WM. SAUNDERS,
Director Experimental Farms.

INDEX.

GENERAL VIEW—EXPERIMENTAL FARM, NAPPAN, N.S.

APPENDIX TO THE REPORT OF THE MINISTER OF AGRICULTURE

EXPERIMENTAL FARMS

REPORTS

OF THE

DIRECTOR		WM. SAUNDERS.
AGRICULTURIST		JAS. W. ROBERTSON.
HORTICULTURIST		JOHN CRAIG.
CHEMIST		F. T. SHUTT, M.A.
ENTOMOLOGIST and BOTANIST		JAS. FLETCHER.
POULTRY MANAGER		A. G. GILBERT.
SUPT. EXPERIMENTAL FARM,	Nappan, N.S.	WM. M. BLAIR.
do do	Brandon, Manitoba	S. A. BEDFORD.
do do	Indian Head, N.W.T.	ANGUS MACKAY.
do do	Agassiz, B.C.	THOS. A. SHARPE.

FOR

1893

PRINTED BY ORDER OF PARLIAMENT

OTTAWA
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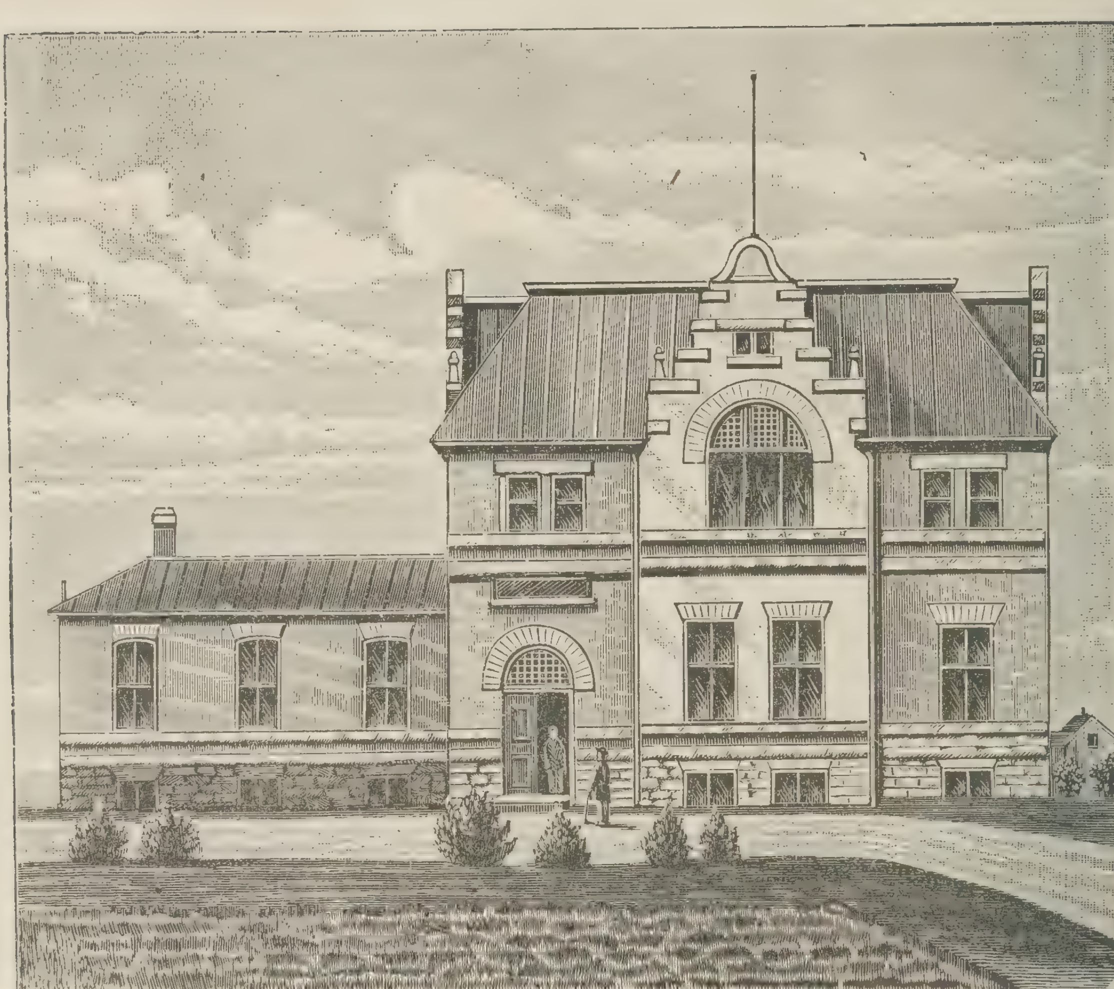

Figure 1.—Office Building, Museum and Chemical Laboratory of the Central Experimental Farm.

APPENDIX

TO THE

REPORT OF THE MINISTER OF AGRICULTURE

ON

EXPERIMENTAL FARMS.

OTTAWA, 30th November, 1893.

SIR,—I have the honour to submit for your approval my seventh annual report of the work done and in progress at the several experimental farms established in different parts of the Dominion.

You will also find appended reports from the following officers of the Central Experimental Farm: From the Agriculturist, Mr. James W. Robertson; from the Horticulturist, Mr. John Craig; from the Chemist, Mr. Frank T. Shutt; and from the Entomologist and Botanist, Mr. James Fletcher. A report is also submitted from the Poultry Manager, Mr. A. G. Gilbert.

From the branch experimental farms there are reports from Mr. Wm. M. Blair, superintendent of the experimental farm for the Maritime Provinces, at Nappan, Nova Scotia; from Mr. S. A. Bedford, superintendent of the experimental farm for Manitoba, at Brandon; from Mr. Angus Mackay, superintendent of the experimental farm for the North-west Territories, at Indian Head; and from Mr. Thos. A. Sharpe, superintendent of the experimental farm for British Columbia, at Agassiz.

In these reports the results are given of much careful experimental work relating to agriculture, horticulture and arboriculture embodying the outcome of much practical work in the fields, orchards, barns, dairy and poultry buildings; also of scientific investigation of chemical problems in the laboratory and the careful study of the life history and habits of noxious insects and plants with suggestions of measures calculated to lessen the injury they cause.

The great and increasing demand among farmers for these reports is a gratifying indication of the growing desire for information among this class of the community and of the high esteem in which these records of the experimental farms are held. It is hoped that the facts brought together in the present issue will be found quite as valuable to the agricultural community as those contained in any of the preceding reports.

I have the honour to be, sir,
Your obedient servant,
WM. SAUNDERS.

The Honourable
The Minister of Agriculture,
Ottawa.

ANNUAL REPORT

ON THE

EXPERIMENTAL FARMS.

REPORT OF THE DIRECTOR.

(WM. SAUNDERS, F.R.S.C., F.L.S., F.C.S.)

The season of 1893 has been very varied, both in its character and results, in different parts of the Dominion. Almost everywhere the spring season has been backward, and cold and wet weather delayed seeding. In the western and central parts of Ontario, a moist spring with an abundant hay crop was followed by a period of severe drought, which, while it did not materially affect the yield of winter wheat, had a marked influence on the different varieties of spring grain, making the average crop light. Summer dairying was also affected by the drying up of the pasture lands: later, timely rains, however, helped the root crops, which turned out fairly satisfactory. In the eastern portions of the province spring growth was also tardy and backward, but under favourable conditions as to moisture an excellent hay crop was gathered. The latter part of the summer was unusually wet, especially just preceding and during the grain harvest, and rust prevailed to such an extent that the weight and quality of spring grain was reduced far below the average, and the returns were in some respects disappointing. The wet weather, however, kept the pasture lands in good condition, and was favourable to the growth of roots for stock, and many varieties have given a generous yield. Fodder corn has also in most localities turned out fairly well.

In most parts of Quebec the season has been favourable, the yield of hay has been good and the subsequent luxuriance of pasture growth most advantageous for dairy farming, in which this province has of late made most gratifying progress. The returns of other crops have also been fairly satisfactory.

In the Maritime Provinces the early part of the season was dry and the hay crop below the average, but later on timely rains occurred in many localities, which were followed by fairly good yields in the harvest season. The later crops of roots were very fine.

In Manitoba and the eastern portions of the North-west Territories, the early part of the summer gave promise of an abundant crop which seemed almost assured, when on the 5th August, within two or three weeks from the usual time of harvest, there began a most unusual heated term. The thermometer ranged during six consecutive days in the neighbourhood of and above 90° F.; and on the 7th rose to 104°—107° F. in the shade. The high temperature on this particular day was accompanied by a parching hot wind, which blew up from the arid and desert regions south in the United States, and which almost scorched the leaves of the growing grain and brought about premature ripening with a considerable loss of bulk. This untoward circumstance reduced the promise of a generally abundant crop with a probable average of about 25 bushels per acre to one of about 14 bushels, the reduction being brought about partly by a diminished size of kernel and partly by the drying up of the later kernels which in a favourable season form towards its close in the upper part of the spikelets which compose the head of wheat. In some sections of the eastern part of Assiniboia the influence of the heated term was less felt and the yield of wheat has been excellent, many large farms having given a return of from thirty to

forty bushels per acre. In Saskatchewan and Northern Alberta the yield of all cereals has been good, the heads being plump and well filled.

In the interior climates of British Columbia, there have been few unusually heavy crops, but the yields in most instances have been fairly satisfactory, while in the coast climate the returns from the grain harvest have been below the average.

While the modifications in crops brought about by conditions of climate are beyond the control of the farmer, there are many conditions which he can influence which are most important in their bearing on plant growth and which under favourable circumstances materially affect the returns. Among these none is more important than the

MAINTENANCE OF THE FERTILITY OF THE SOIL,

which is the chief aim of all good farming and on which a continuance of good crops mainly depends. In the soil a large store of fertility has been laid up for man's use, which may be regarded as a savings bank reserve for the farmer, and by judicious treatment may be continually added to and improved, but by careless and injudicious management may be prodigally wasted. All soils are the result of the disintegration of rocks by the forces of nature and the intermixture therewith of organic matter, resulting from the decay of animal and vegetable remains. They vary much in fertility, partly owing to difference in composition of the rocks from which they have been formed, partly to the variable proportion of organic matter they contain, and partly to their mechanical condition and texture. These variations are commonly distinguished by special terms such as clayey, loamy, sandy or gravelly soils, indicating the materials which form the larger proportion of their bulk. The productiveness of a soil also depends partly on its power of holding water and of drawing supplies of moisture from below. Water which in the soil is usually more or less charged with carbonic acid gas is the universal solvent which nature employs to convey food to the rootlets of plants. A good loamy soil will hold much more moisture than either clay or sand and retain it longer, and among the main advantages resulting from a thorough working of the soil are the prevention of loss of water by lessening rapid and excessive evaporation during the summer, also the opening of it and making it more porous, so that its power of retaining moisture may be increased and its particles at the same time exposed to the beneficial action of air and frost. All soils contain more or less plant food in a soluble form which is immediately available for the use of growing plants—on the other hand there is always a large proportion of the elements of fertility, the immediate use of which the farmer cannot command, and which can only be made available gradually through the influences referred to.

CONSTITUENTS TAKEN FROM THE SOIL.

Of the mineral constituents which enter into the composition of soil, quite a number are taken up by living plants in varying proportions, but of many of the ingredients the quantities used are small and the store of such contained in the soil is usually very ample. There are, however, three ingredients which plants take in comparatively large proportions from the land, which must sooner or later in some measure be restored to it if continual good crops are to be looked for. These are nitrogen, phosphoric acid and potash. All arable land contains these important ingredients and usually in considerable proportions.

It is estimated that an acre of soil a foot deep, weighs on an average about 3,500,000 lbs., and that good ordinary loam in Europe, estimated from the results of many analyses will contain an average of not less than 3,500 lbs. per acre of nitrogen and sometimes more than that. The quantity of phosphoric acid varies in the same area from about 3,000 to 6,000 lbs., and potash from 5,000 to 8,000 lbs. From the analyses made by the Chemist of the Experimental Farms, Mr. F. T. Shutt, during the past three years, some of the samples being representative of large areas, it would appear that the soils of Canada compare favourably with those of Europe in their richness in these important constituents.

Seventeen samples from different parts of the eastern provinces, presuming the fertile soil to have a depth of nine inches have averaged as follows : Nitrogen 6,247 lbs. per acre, phosphoric acid 3,596 lbs., and potash 6,510 lbs. Thirteen samples from different parts of the North-west plains, have also been submitted to analysis. These soils are deeper and may safely be estimated at twelve inches, and on this basis they show an average in nitrogen of 10,115 lbs. per acre, phosphoric acid 5,040 lbs., and potash 10,500 lbs.

When any of these important constituents are present in the soil in unusually large proportion, plants will sometimes, under such circumstances, take up such material in larger quantity than where the same crop is grown on poorer land. The proportions, however, which are taken from the soil are on the whole fairly uniform and for some of the more important crops may be approximately stated as below. As far as the material has been available, the figures in the following estimates have been compiled from the analyses made by the chemist of the experimental farms, supplemented by information from the "Compilation of Analyses of American Feeding Stuffs," issued by the United States Department of Agriculture, 1892. The proportions of phosphoric acid and potash have been calculated from analyses conducted by Dr. Goessmann, published in the 10th annual report of the State Agricultural Experimental Station, Amherst, Mass., 1892, and from Wolff's tables as given in "How Crops Grow," by Johnson.

——	Nitrogen, in lbs.	Phosphoric Acid, in lbs.	Potash in lbs.
A wheat crop of 25 bushels per acre, with 2,200 lbs. of straw, takes—			
For the grain weighing 1,500 lbs	28·50	12·68	8·54
" straw " 2,200 "	12·03	4·96	10·57
Total	40·53	17·64	19·11
A barley crop of 35 bushels per acre, with 2,000 lbs. of straw, takes—			
For the grain weighing 1,680 lbs	33·26	13·28	8·86
" straw " 2,000 "	12·22	3·86	19·39
Total	45·48	17·14	28·25
A crop of oats of 50 bushels to the acre, with 2,200 lbs. of straw, takes—			
For the grain weighing 1,700 lbs.	32·13	10·48	8·05
" straw " 2,200 "	13·90	4·74	24·83
Total	46·03	15·22	32·88
A crop of Indian corn grown for fodder purposes, to the period when the ears are in the late milk or glazing stage, takes from the soil for each ton	5·80	2·96	6·54
In the following estimates of the fertilizers extracted from the soil by root crops, the roots alone are considered, it being understood that the tops are cut off and left on the ground to be ploughed under and the fertilizing constituents they contain returned to the soil :—			
A crop of turnips takes from the soil for each ton of roots grown...	3·30	1·86	5·50
" mangels " " " ..	3·03	1·84	7·66
" carrots " " " ..	2·35	2·22	6·53
" sugar beets " " " .	4·79	1·92	9·06

It is a very important question, but one concerning which on account of its complex character, no very exact information can be given as to what effect the various natural and artificial fertilizers have on particular crops, and which are the most economical to use, to replace the important constituents taken from the soil by constant cropping. The results obtained from any method of treatment will, as a matter of course, depend largely on the proportion of these respective ingredients existing naturally in the soil; much also depends on the character of the season, whether it be favourable or unfavourable for the crop. Some conclusions however more or less general in their character, may be drawn from careful experiments on any soil, and with the object of gaining information on this important topic, a series of experiments was planned and begun on the Central Experimental Farm six years ago, which may be outlined as follows:—

TESTS OF THE ACTION OF FERTILIZERS ON SOME CROPS.

A piece of sandy loam, more or less mixed with clay, which was originally covered with heavy timber, chiefly white pine was chosen for these tests. The timber was cut many years ago, and among the stumps still remaining when the land was purchased, there had sprung up a thick second growth of trees, chiefly poplar, birch and maple, few of which exceeded six inches in diameter at the base. Early in 1887 this land was cleared by rooting up the young trees and stumps and burning them in piles on the ground from which they were taken, the ashes being afterwards distributed over the soil as evenly as possible, and the land ploughed and thoroughly harrowed. Later in the season it was again ploughed and harrowed, and most of it got into fair condition for cropping.

The plots laid out for the experimental work with fertilizers were one-tenth of an acre each, 21 of which were devoted to experiments with wheat, 21 to barley, 21 to oats, 21 to Indian corn r maize, and 21 to experiments with turnips and mangels. Owing to the difficulty and unavoidable delay attending the draining of some wet places, it was not practicable to undertake work on all the plots the first season. The tests were begun in 1888 with 20 plots of wheat and 16 of Indian corn, and in 1889 all the series were completed excepting six plots of roots, Nos. 16 to 21 inclusive, which were available for the work in 1890. The season of 1889 was wet when several of the plots were found to be insufficiently drained and the crops suffered in consequence. This will be mentioned when the results for that season on these particular plots are given. In the tables the result of the crop of each year is shown, also the average for the whole period during which the experiments have been continued.

In 1890 it was found that all the grain plots had become so weedy that the growth of the crops was much interfered with, and with the view of cleaning the land one-half of each of the wheat and oat plots was sown with carrots in 1891, and one-half of each of the barley plots with sugar beets. In 1892 the other half of each plot in each of these series was sown with carrots. In 1893 it was thought desirable to continue this cleaning process, and carrots were again sown on the half of the wheat and oat plots occupied with this crop in 1891, and also on the half of the barley plots cropped with sugar beets that year. It is expected that at the end of another season, the whole of these plots will be sufficiently free from weeds to warrant their being sown entirely with grain again. In the meantime some information has been gained by these tests as to the effect of the different fertilizers on carrots and sugar beets, which will be given in this connection.

WHEAT PLOTS.

The seed sown on each of these plots from the beginning has been in the proportion of $1\frac{1}{2}$ bushels per acre, and each year they have all been sown on the same day. The variety chosen at the outset for sowing was the White Russian, and this was continued during 1889, 1890 and 1891. In 1892 Campbell's White Chaff was

substituted and this variety was also sown in 1893. The following are the records of the dates of sowing, coming up and ripening of the wheat each year:—1888, sown May 23rd, appeared above ground May 28th, ripe August 24th. 1889, sown May 17th, came up May 22nd, ripe August 30th. 1890, sown April 28th, come up May 13th, ripe August 12th. 1891, sown May 9th, came up May 18th, ripe August 24th. 1892, sown May 6th, came up May 15th, ripe August 14th. 1893, sown May 27th, came up June 2nd, ripe August 23rd. It will thus be seen that the White Russian wheat required from the date of sowing to maturity a period of 93 days in 1888; 105, in 1889; 106, in 1890; and 107, in 1891, or an average for the four years of nearly 103 days. The Campbell's White Chaff matured in 100 days from the date of sowing in 1892 and in 88 days in 1893, an average for the two years of 94 days.

TREATMENT OF SOIL.

The usual treatment of the soil on all the grain plots has been to gang plough soon after harvest and after the shed grain and weeds have well started to plough again about 7 inches deep. In spring the plots have been disc-harrowed twice before applying the fertilizers and again harrowed with the toothed or smoothing harrow before sowing. On those plots where barnyard manure has been used, the manure has been lightly ploughed under as soon as possible after it has been spread on the land and harrowed with the smoothing harrow before sowing. Wherever barnyard manure is spoken of it is understood to be a mixture of horse and cow manure in about equal proportions.

REMARKS.

The season of 1891 was quite favourable for wheat growing whereas 1890 and 1893 were specially unfavourable which will in a measure account for the great variation in the crops of these years notwithstanding the quantities of fertilizers applied to the land in the intervals. This also serves to show that the character of the season has a more immediate effect on the crop of the year than any application of fertilizers no matter how complete or liberal that may be. We may however rest assured that the useful elements of fertility stored in the soil will not be lost, but that they will materially aid in every favourable season by increasing the crop returns.

BARLEY PLOTS.

The quantity of seed sown per acre on the barley plots was 2 bushels in the years 1889, 1890 and 1891 and $1\frac{1}{2}$ bushels in 1892 and 1893. Two-rowed barley has been used for seed throughout the whole period. The variety chosen for the first three years was the Saale barley, which is highly esteemed by the brewers of Great Britain, followed by the Goldthorpe in 1892 and the Duckbill in 1893. In 1889 the seed was sown May 17th, came up May 22nd and the grain was ripe August 20th. 1890, sown April 28th, came up May 13th, was ripe August 11th. 1891, sown May 9th, came up May 16th, was ripe August 17th. 1892, sown May 6th, came up May 15th, was ripe August 18th. 1893 was sown May 27th, came up June 2nd and was harvested August 20th. The average time required from the date of sowing to maturity during the three years in which the Saale barley was used as seed was $99\frac{2}{3}$ days, the Goldthorpe matured in 1892 in 104 days from date of sowing and the Duckbill in 1893 in 85 days.

EXPERIMENTS with Fertilizers on Plots of Wheat $\frac{1}{10}$ acre each.

No. of Plot.	Manure applied each Year.	1st Season, 1888. Variety, White Russian.			2nd Season, 1889. Variety, White Russian.			3rd Season, 1890. Variety, White Russian.			4th Season, 1891. Variety, White Russian.			5th Season, 1892. Variety, Campbell's White Chaff.			6th Season, 1893. Variety, Campbell's White Chaff.			Average for the whole Period.		
		Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.
		Per acre		Per acre	Per acre		Per acre	Per acre		Per acre	Per acre		Per acre	Per acre		Per acre	Per acre		Per acre	Per acre		Per acre
		Bush.	Lbs.	Lbs.	Bush.	Lbs.	Lbs.	Bush.	Lbs.	Lbs.	Bush.	Lbs.	Lbs.	Bush.	Lbs.	Lbs.	Bush.	Lbs.	Lbs.	Bush.	Lbs.	Lbs.
1	Barn-yard manure (mixed horse and cow manure) well rotted, 12 tons per acre in 1888; 15 tons per acre each year since	12	30	Not taken.	16	..	4220	12	30	2660	22	40	2690	20	40	3260	12	30	3070	16	8⅓	3180
2	Barn-yard manure (mixed horse and cow manure) fresh, 12 tons per acre in 1888; 15 tons per acre each year since	16	40	do	16	30	4290	10	30	2220	24	20	2860	18	20	2860	14	..	2790	16	43⅓	3004
3	Unmanured	12	30	do	10		3480	4	40	590	16	20	2140	6	40	1460	7	..	1420	9	31⅔	1818
4	Mineral phosphate, untreated, finely ground, 500 lbs. per acre	13	10	do	10	20	3460	4	15	645	18	20	1260	6	..	1360	7	20	1600	9	54⅙	1665
5	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs. per acre	14	10	do	12	10	4270	6	50	1425	18	20	3420	9	..	2320	9	10	2310	11	36⅔	2749
6	Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre; mineral phosphate, untreated, finely ground, 500 lbs. per acre, composted together, intimately mixed, and allowed to heat for several days before using	14	20	do	16	50	4520	7	35	1300	22	20	2490	15	20	2880	8	40	2120	14	10⅚	2662
7	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre	13	30	do	8	5	2895	5	30	1200	17	40	2880	7	40	1960	5	..	2520	9	34⅙	2291
8	Mineral phosphate, untreated, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre	11	40	do	6	50	1460	4	45	695	21	00	2460	6	40	1760	4	50	1320	9	17½	1539
9	Mineral superphosphate, No. 1, 500 lbs. per acre	13	10	do	10	..	1930	4	35	665	21	10	2570	7	40	1840	7	20	1180	10	39⅙	1637
10	Mineral superphospate, No. 1, 350 lbs.; nitrate of soda, 200 lbs. per acre	12	40	do	10	15	3165	6	25	1225	24	20	4600	10	40	2520	8	20	2240	12	6⅔	2750

11	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,500 lbs. per acre.	12	40	do	7	30	2130	6	50	1060	23	20	3010	10	..	2340	9	20	2410	11	$36\frac{2}{3}$	2190
12	Unmanured....................	14	50	do	3	10	1370	6	20	965	16	50	2270	8	20	1500	5	..	1280	9	5	1477
13	Bone finely ground, 500 lbs. per acre..	14	..	do	3	20	1080	6	45	970	20	..	2360	8	45	1495	4	..	2020	9	$28\frac{1}{3}$	1585
14	Bone finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre.	16	..	do	3	50	1320	8	5	1025	24	20	3170	10	20	1800	7	20	1900	11	$39\frac{1}{6}$	1843
15	Nitrate of soda, 200 lbs. per acre......	16	40	do	7	15	2745	9	30	1275	21	..	3230	9	20	1860	9	20	1700	12	$10\frac{5}{6}$	2162
16	Muriate of potash, 150 lbs. per acre...	15	10	do	7	40	1720	8	20	1030	26	..	3020	10	20	1620	9	40	1630	12	$51\frac{2}{3}$	1804
17	Sulphate of ammonia. 300 lbs. per acre	14	.	do	7	55	2055	7	45	1135	20	40	3320	7	40	2100	6	50	3290	10	$48\frac{2}{3}$	2380
18	Sulphate of iron, 60 lbs. per acre.....	13	30	do	10	15	2165	6	30	685	21	20	3960	10	20	1580	6	20	1560	11	$22\frac{1}{2}$	1990
19	Common salt (sodium chloride) 300 lbs. per acre....................	11	50	do	10	..	1680	5	40	630	15	..	2410	10	40	1540	8	30	1670	10	$16\frac{2}{3}$	1586
20	Land plaster or gypsum (calcium sulphate) 300 lbs. per acre......	13	40	do	10	15	3375	4	35	485	20	40	2650	10	40	1360	8	..	1400	11	$18\frac{1}{3}$	1854
21	Unmanured in 1889, mineral superphosphate, No. 2, 500 lbs. per acre each year since.............	No crop tak'n in 1888...		....	11	10	2510	5	30	675	20	..	2650	10	40	1480	8	20	1360	11	8	1735

EXPERIMENTS with Fertilizers on Plots of Barley, $\frac{1}{10}$th acre each.

No. of Plot.	Manure applied each Year.	1st Season, 1889. Variety Sown—Saale, two-rowed.			2nd Season, 1890. Variety Sown—Saale, two-rowed.			3rd Season, 1891. Variety Sown—Saale, two-rowed.			4th Season, 1892. Variety Sown, Goldthorpe, two-rowed.			5th Season, 1893. Variety Sown, Duckbill, two-rowed.			Average for the whole Period.		
		Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.	Yield of Grain		Yield of Straw.	Yield of Grain.		Yield of Straw.
		Per acre		Per acre	Per acre		Per acre	Per acre		Per acre	Per acre		Per acre	Per acre		Per acre	Per acre		Per acre
		Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.
1	Barn-yard manure well rotted, 15 tons per acre	26	2	1·50	17	11	1852	37	24	3510	35	40	3980	28	16	3080	28	47⅖	2854
2	Barn-yard manure, fresh, 15 tons per acre.	22	4	1840	24	4	2875	40	40	3800	32	24	3460	29	38	3630	29	41⅕	3121
3	Unmanured.	18	16	1570	10	35	1440	22	44	2030	10	20	1860	7	24	1220	13	47	1624
4	Mineral phosphate, untreated, finely ground, 500 lbs. per acre.	17	19	1515	11	10	833	28	26	2330	8	16	1600	10	10	1320	15	6⅗	1520
5	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs. per acre.	19	33	1755	12	16	1805	35	10	2980	10	20	2380	18	16	2540	19	9⅖	2292
6	Barn-yard manure partly rotted, and actively fermenting, 6 tons per acre; mineral phosphate, untreated, finely ground, 500 lbs. per acre, composted together, intimately mixed and allowed to heat for several days before using	23	16	1980	19	38	1875	42	4	2990	27	44	3280	13	36	2120	25	18	2449
7	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre	18	36	1800	13	39	1803	33	16	3240	15	40	2920	24	38	2320	21	14⅗	2417
8	Mineral phosphate, untreated, finely ground, 500 lbs.; wood ashes unleached, 1,500 lbs. per acre.	15	40	1440	10	15	825	31	12	2590	12	44	2200	17	4	1680	17	23	1747
9	Mineral superphosphate No. 1, 500 lbs. per acre.	24	28	2020	14	8	1570	30	40	4510	19	28	2100	15	40	1550	21		2350
10	Mineral superphosphate No. 1, 350 lbs.; nitrate of soda, 200 lbs. per acre.	20	40	2000	15	5	1670	33	36	3190	21	32	2880	25	10	2390	23	15	2426
11	Mineral superphosphate No. 1, 350 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,500 lbs. per acre	20	20	2380	16	7	1885	33	16	3390	13	36	2580	25	40	2680	21	43	2583
12	Unmanured	15	25	1155	11	12	760	21	42	2050	12	44	1900	6	42	1110	13	33	1395
13	Bone, finely ground, 500 lbs. per acre	14	38	1040	9	28	685	23	36	2200	12	24	1720	17	44	1290	15	34	1387
14	Bone, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre	18	36	1900	13	11	1790	28	46	2510	20		2460	19	28	1500	20	5	2032

15	Nitrate of soda, 200 lbs. per acre........	18	26	2210	18	26	2140	33	36	3760	15		2720	25		2940	22	8	2754
16	Muriate of potash, 150 lbs. per acre.....	19	3	1955	19	23	1925	32	34	2810	12	44	2340	23	36	1590	21	28	2124
17	Sulphate of ammonia, 300 lbs. per acre..	18	26	1410	15	25	1975	28	36	3510	13	16	2320	18	36	2540	18	47	2351
18	Sulphate of iron, 60 lbs. per acre.... ..	23	36	2060	13	1	865	32	44	3440	12	44	2140	16	42	2030	19	43	2107
19	Common salt (sodium chloride) 300 lbs. per acre..........................	25	00	800	22	4	1955	41	12	3140	22	4	2380	25	30	2350	27	10	2125
20	Land plaster or gypsum (calcium sulphate), 300 lbs. per acre....	25	35	1765	19	8	1690	34	8	2950	18	16	2060	17	4	1390	22	43	1971
21	Mineral superphosphate No. 2, 500 lbs. per acre.	21	42	1050	14	28	735	36	42	3980	18	36	040	17	24	1760	21	44	1913

EXPERIMENTS with Fertilizers on Plots of Oats, $\frac{1}{10}$th acre each.

No. of Plot.	Manure applied each Year.	1st Season, 1889. Variety Sown, Early English. Yield of Grain. Per acre		Yield of Straw. Per acre	2nd Season, 1890. Variety Sown, Prize Cluster. Yield of Grain. Per acre		Yield of Straw. Per acre	3rd Season, 1891. Variety Sown, Prize Cluster. Yield of Grain. Per acre		Yield of Straw. Per acre	4th Season, 1892. Variety Sown, Prize Cluster. Yield of Grain. Per acre		Yield of Straw. Per acre	5th Season, 1893. Variety Sown, Prize Cluster. Yield of Grain. Per acre		Yield of Straw. Per acre	Average for the Whole Period. Yield of Grain. Per acre		Yield of Straw. Per acre
		Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.
1	Barn-yard manure, well rotted, 15 tons per acre	16	6	1800	40	20	2615	41	6	2630	48	28	3520	18	18	3410	33	2	2795
2	Barn-yard manure, fresh, 15 tons per acre	14	24	2000	45	10	2860	40	..	2910	47	2	2920	32	32	3200	36	..	2778
3	Unmanured	15	5	1885	31	26	1260	39	14	1120	31	26	1460	15	10	1760	26	23	1497
4	Mineral phosphate, untreated, finely ground, 500 lbs. per acre	15	20	2070	35	30	1570	27	22	2600	36	16	1580	18	8	1680	26	26	1880
5	Mineral phosphate, untreated, finely ground; 500 lbs. nitrate of soda, 200 lbs. per acre	13	18	1840	40	20	1655	58	8	2870	55	10	3120	28	18	3660	39	8	2629
6	Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre; mineral phosphate, untreated, finely ground, 500 lbs. per acre, composted together, intimately mixed and allowed to heat for several days before using	19	4	2350	41	6	2365	46	16	2990	38	6	2380	21	26	2740	33	18	2565
7	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre	12	7	1985	36	16	2350	50	..	3190	47	2	4120	18	28	3590	32	31	3047
8	Mineral phosphate, untreated, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre	14	29	2565	41	6	2160	55	30	3200	35	10	2160	17	22	2140	32	33	2445
9	Mineral superphosphate, No. 1, 500 lbs.	13	33	2525	32	32	1940	41	6	2350	29	14	1920	18	8	1840	27	5	2115
10	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs. per acre	13	8	2150	37	32	2035	55	10	2990	43	18	3480	13	28	3730	32	26	2877
11	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,500 lbs. per acre	12	32	2060	32	32	1760	42	12	2620	37	22	2540	23	18	2510	29	30	2298
12	Unmanured	12	22	2770	26	16	1080	33	18	2150	26	16	1500	15	30	1280	23	..	1756
13	Bone, finely ground, 500 lbs. per acre	11	26	2000	27	32	1555	37	22	2210	33	18	1960	18	28	2060	25	32	1957
14	Bone, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre	15	1	2090	31	6	1555	38	8	1260	30	..	2340	17	2	1850	26	17	1819
15	Nitrate of soda, 200 lbs. per acre	15	5	1785	31	21	1845	44	..	3050	60	20	1700	19	14	3140	34	5	2304

16	Muriate of potash, 150 lbs. per acre...	11	16	3010	35	20	1950	37	22	2710	41	6	2060	24	4	2270	30	..	2400
17	Sulphate of ammonia, 300 lbs. per acre.	11	26	2700	34	27	2017	41	6	3050	48	8	4420	24	24	4000	32	5	3237
18	Sulphate of iron, 60 lbs. per acre.......	16	6	2450	32	32	1260	37	22	2750	44	4	2440	18	18	2220	29	30	2224
19	Common salt (sodium chloride) 300 lbs. per acre..........	15	10	2180	34	4	2020	30	20	2100	32	32	2340	24	4	2090	27	14	2146
20	Land plaster or gypsum (calcium sulphate), 300 lbs. per acre...	16	26	2930	31	6	1030	31	26	2260	37	22	2200	21	16	3190	27	26	2322
21	Mineral superphosphate No. 2, 500 lbs. per acre.	15	..	2290	23	23	1055	32	2	2480	42	12	2020	17	2	1980	26	1	1965

REMARKS.

It will be observed that the yields of barley throughout the five years during which these tests have been continued are much more even in character than those of the wheat or oats. This is no doubt due partly to the fact that the land devoted to these plots is more uniform throughout than that set apart for the wheat and oats, and partly for the reason that the roots of the barley plant being comparatively near the surface are more immediately influenced by the application of fertilizers. The plant also seems to be more robust. As in the case of the wheat, it will be seen that the season of 1891 was favourable for this crop.

OAT PLOTS.

The quantity of seed sown per acre on the oat plots was 2 bushels in 1889 and 1890, and $1\frac{1}{2}$ in 1891, 1892 and 1893. The variety chosen for sowing in 1889 was the Early English, but as that seemed to be very subject to rust, the Prize Cluster was substituted in 1890 and has been continued each year since. In 1889 the seed was sown 18th May, came up 25th May and was ripe 16th August. 1890, sown 26th April, came up 14th May, ripe 8th August. 1891, sown 9th May, came up 16th May, ripe 16th August. 1892, sown 6th May, came up 15th May, ripe 16th August. 1893, sown 27th May, came up 2nd June, and was ripe 15th August. The Early English oats required 90 days in 1889 from the date of sowing to that of ripening, while the experience of the four subsequent years gives 96 days as the average time required to bring the Prize Cluster to maturity.

REMARKS.

The yield of oats by the different plots for the five years during which these tests have been continued, will be found very variable. A comparison of the figures shows that the year 1891 was the most favourable one in the series when all the plots averaged over 41 bushels per acre. The seasons of 1890 and 1892 were also favourable: in the latter, the plots averaged about 40 bushels, and in the former nearly 35 bushels. In 1889 and 1893 the crops were much lighter.

CORN PLOTS.

In conducting the experiments with the plots of Indian corn the object has been to obtain the largest weight of well matured green fodder for the silo, and to have that fodder so far advanced that when the corn is cut the ears shall be in the "late milk" or "glazed" condition. It was decided to test two varieties each year, growing $\frac{1}{20}$ of an acre of each. At first a 'dent' corn, the Mammoth Southern Sweet was grown, with one of the flint sorts known as the Canada Yellow, and the cultivation of these two was continued during 1888, 1889 and 1890. In 1891 another 'dent' corn, the Red Cob Ensilage, was substituted for the Mammoth Southern Sweet, while the Rural Thoroughbred White Flint, one of the larger and stronger growing of the flint varieties replaced the Canada Yellow. Since neither of the dent sorts named attained to a sufficient degree of maturity to make good ensilage, another change was made in 1892, and two flint varieties grown, the Thoroughbred White Flint, and an earlier sort known as Pearce's Prolific. The stronger grower of the two sorts selected each year has been designated No. 1, and the less vigorous sort No. 2. The dent varieties all rank as No. 1, and in 1891 the Thoroughbred White Flint is classed as No. 2, but in the two following years this useful sort being a more vigorous grower than Pearce's Prolific, has found a place in the No. 1 series. For the first four years the No. 1 series was planted in drills 3 feet apart, using about 24 pounds of seed to the acre, and thinning the plants when up to 6 or 8 inches apart, and the No. 2 in hills 3 feet apart each way, 4 to 5 kernels in a hill. During the past two years both sorts have been grown in hills.

In 1888 they were planted June 7th, came up June 13th, and harvested September 12th. 1889, planted May 23rd, came up June 4th, harvested September 12th. 1890, planted May 21st, came up May 31st, harvested September 8th. 1891, planted May 21st, came up May 31st, harvested September 22nd. 1892, planted May 23rd, came up June 3rd, harvested September 17th. 1893, planted June 9th, came up June 19th, harvested October 3rd.

REMARKS.

The yields of corn for the several years are quite variable, the better crops having been realized in 1889-1890 and 1891. In 1889 the entire series of plots under No. 1 averaged 18 tons, 1895 lbs, and those under No. 2, 10 tons, 1503 lbs; in 1890 No. 1 plots 15 tons, 728 lbs; No. 2, 10 tons, 1528 lbs., and in 1891 the No. 1 plots gave an average return of 16 tons, 1265 lbs,, and the No. 2 plots 11 tons, 816 lbs. An anomalous result appears in the yield of plot 1 as compared with plot 2 for 1891. The yield of plot 1 on which well rotted manure is used was for that year at the rate of 15 tons 1,440 lbs. per acre, whereas the yield from plot 2 where the same weight of fresh manure is used was 33 tons and 20 lbs. The advantage if any in using fresh manure would be quite insufficient to account for this difference. On several occasions individual plots have been injured and the yield much lessened by the young plants being eaten off by cutworms, and as this plot is the outer one in the series, it would be specially liable to such depredations; although it has escaped record, it is quite probable that the short crop in this instance has resulted mainly from that cause. The yield from plot 4 to which 500 lbs per acre of finely ground untreated, mineral phosphate have been applied each year has in most instances been less than the crop from No. 3, the adjoining unmanured plot: this has resulted from a part of plot 4 lying comparatively low, and as a consequence the corn suffers in wet seasons. Plots 18, 19 and 20 have given comparatively poor returns for several years past. On these the soil is heavier and colder than on the other plots and not so suitable for corn, particularly in wet seasons.

PLOTS OF MANGELS AND TURNIPS.

In conducting these experiments the roots only have been taken from the land, the tops have always been cut off and left on the ground to be ploughed under so that the fertilizing constituents they have taken from the soil might be returned to it, one-half of each $\frac{1}{10}$ acre plot in the series has been devoted to mangels and the other half to turnips. The varieties in each case have been changed from time to time and sometimes several varieties have been used on the same plot. In 1889 the variety of mangel chosen was the Mammoth Long Red, while on the half of the plot devoted to turnips two varieties were used mentioned in the table as Nos. 1 and 2, 28 rows being sown with Carter's Prize Winner and 2 rows with Carter's Queen of Swedes. In 1890 three varieties of mangels were sown, 14 rows with Mammoth Long Red, 5 with Mammoth Long Yellow, and 5 rows with Golden intermediate. These are designated in the table as Nos. 1, 2 and 3. Carter's Elephant Swede was selected that year for the turnip plot. In 1891 three varieties of mangels were used and six of turnips. The mangels consisted of 18 rows of Mammoth Long Red, 3 of Yellow Fleshed Tankard and 6 rows of Golden Tankard. The turnips were 6 rows of Lord Derby Swede, 4 New Giant King, 3 Imperial Swede, 6 Champion Swede, 4 Purple Top Swede, and 4 rows of East Lothian Swede. In the table the mangels are referred to as Nos. 1, 2 and 3. and the turnips as Nos. 1, 2, 3, 4, 5 and 6. In 1892 and 1893, the Mammoth Long Red was used alone in the division for mangels while the variety of turnip chosen for 1892 was the Improved Purple Top Swede, and in 1893 the Prize Purple Top Swede. The season of 1889 gave the largest returns both for mangels and turnips: the crops in 1890 and 1892 were also fair; while those of 1891 and 1893 were very poor. In the first year of the course the mangel division of plots 11 and 13 suffered from imperfect drainage and during

EXPERIMENTS with Fertilizers, on plots of Indian Corn, $\frac{1}{10}$th acre each, cut green for Ensilage.

No. of Plot.	Manure applied each year.	1st Season, 1888.				2nd Season, 1889.				3rd Season, 1890.				4th Season, 1891.				5th Season, 1892.				6th Season, 1893.				Average for the whole period.			
		½ Plot No. 1—Mam. Southern Sweet, weight of green fodder.		½ Plot No. 2—Canada Yellow, weight of green fodder.		½ Plot No. 1—Mam. Southern Sweet, weight of green fodder.		½ Plot No. 2—Canada Yellow, weight of green fodder.		½ Plot No. 1—Mam. Southern Sweet, weight of green fodder.		½ Plot No. 2—Canada Yellow, weight of green fodder.		½ Plot No. 1—Red Cob Ensilage, weight of green fodder.		½ Plot No. 2—Thoroughbred White Flint, w. of green fodder.		½ Plot No. 1—Thoroughbred White Flint, w. of green fodder.		½ Plot No. 2—Pearce's Prolific, weight of green fodder.		½ Plot No. 1—Thoroughbred White Flint, w. of green fodder.		½ Plot No. 2—Pearce's Prolific, weight of green fodder.		No. 1—Weight of green fodder.		No. 2—Weight of green fodder.	
		Per acre		Per acre		Per acre		Per acre		Per acre		Per acre		Per acre		Per acre		Per acre		Per acre		Per acre		Per acre		Per acre		Per acre	
		Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.
1	Barn-yard manure, well rotted, 12 tons per acre...	14	500	13	500	19	1200	9	1320	20	1900	15	1600	15	1440	13	700	15	760	13	700	10	400	7	1460	16	34	12	380
2	Barn-yard manure, fresh, 12 tons per acre...	13	1420	14	960	22	400	11	1520	22	445	14	1220	33	20	14	660	15	820	9	140	12	1320	6	1380	19	1737	11	1647
3	Unmanured...	10	1100	11	120	10	1660	6	1120	15	320	10	1370	13	300	8	360	10	420	4	1040	6	1320	3	440	11	187	7	741
4	Mineral phosphate untreated, finely ground, 500 lbs. per acre in 1888—800 lbs. per acre each year since..	12	1360	9	1720	14	1200	6	1780	12	170	6	1100	9	1260	6	1120	5	1740	4	320	3	660	2	1580	9	1398	6	270
5	Mineral phosphate, untreated, finely ground, 500 lbs. per acre in 1888—800 lbs. per acre, each year since; nitrate of soda, 200 lbs. per acre....	13	360	13	420	17	600	9	40	12	120	12	760	19	1460	9	900	12	880	5	680	6	880	5	940	13	1050	9	290
6	Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre; mineral phosphate, untreated, finely ground, 500 lbs. per acre, composted together, intimately mixed and allowed to heat for several days before using...	14	500	14	1800	23	1200	11	1880	19	240	14	120	24	1820	17	820	15	1620	8	140	12	300	8	1160	18	613	12	987
7	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre...	14	200	14	640	21	1200	11	1280	15	1280	11	1060	23	120	11	1620	15	980	8	540	11	20	8	800	16	1633	10	1990
8	Mineral phosphate, untreated, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre...	13	1540	14	1040	18	1300	10	460	15	1330	8	170	14	780	10	40	9	1720	7	400	8	1300	5	1280	13	828	9	565
9	Mineral superphosphate No. 1, 500 lbs. per acre...	14	1000	14	480	19	500	11	340	11	1840	10	1400	13	980	9	1300	10	360	6	660	6	1600	5	1800	12	1380	9	133

10	Mineral superphosphate No. 1, 350 lbs.; nitrate of soda, 200 lbs. per acre.	13 50	13 940	20 1800	12 800	18 1780	11 940	15 620	15 1460	13 560	7 1500	12 900	7 100	15 1285	11 623
11	Mineral superphosphate No. 1, 350 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,500 lbs. per acre.	15 1180	16 680	22 1400	11 1420	20 1710	15 250	18 1920	16 1220	14 20	9 1400	12 860	9 400	17 848	13 228
12	Unmanured	13 1340	17 40	18 650	14 180	15 1620	10 340	12 1980	10 1860	8 1840	6 1340	7 1840	4 1680	12 1878	10 1240
13	Bone, finely ground, 500 lbs. per acre.	13	17 1220	19 800	10 60	13 480	10 580	15 1340	7 1920	9 660	7 360	8 260	5 1180	13 257	9 1553
14	Bone, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre.	14 1080	15 380	18 1100	10 340	14 1820	9 40	16 1480	10 1480	8 1240	6 1480	8 60	5 600	13 1130	9 1053
15	Nitrate of soda, 200 lbs. per acre......	13 480	15 1620	21 1000	11 1800	15 1120	13 210	17 1540	13 820	12 1120	7 1500	10 660	5 1860	15 320	11 635
16	Sulphate of ammonia, 300 lbs. per acre.	14 320	15 380	20 800	13 20	15 830	12 1000	19 660	13 480	11 1460	6 1500	10 200	6 420	15 428	11 300
17	Mineral superphosphate No. 1, 600 lbs.; muriate of potash, 200 lbs.; sulphate of ammonia, 150 lbs. per acre	No crop taken in 1888.	No crop taken in 1888.	16 600	9 860	16 600	11 840	17 860	13 1820	10 820	8 480	10 1960	5 1760	14 568	9 1552
18	Muriate of potash, 300 lbs. per acre...	"	"	16 200	9 1660	12 720	6 660	12 980	7 320	6 1760	5 80	5 760	4 360	10 1284	6 1016
19	Double sulphate of potash and magnesia, 300 lbs. per acre in 1889 and '90; muriate of potash, 200 lbs., substituted each year since; dried blood, 300 lbs.; mineral superphosphate No. 1, 500 lbs. per acre	"	"	17 1800	10 1340	13 1240	9 1160	11 320	9 1740	9 1840	7 1660	10 120	5 760	12 1064	8 1332
20	Wood ashes, unleached, 1,900 lbs. per acre....................	"	"	16 400	10 100	14 80	5 340	11 1560	9 1020	6 1400	6 1120	5 1760	5 460	10 1840	7 608
21	Bone, finely ground, 500 lbs.; sulphate of ammonia, 200 lbs.; muriate of potash, 200 lbs. per acre	"	"	20 00	13 1240	16 1650	7 1925	12 1140	9 1480	9 650	7 520	8 1200	5 1700	13 928	8 1773

8c—2½

EXPERIMENTS with Fertilizers on Roots; Plots of Mangels and Turnips, $\frac{1}{10}$ acre each.

No. of Plot.	Manure applied each Year.	1st Season, 1889.				2nd Season, 1890.				3rd Season, 1891.				4th Season, 1892.				5th Season, 1893.				Average for the whole Period.			
		West ½ Plot.		East ½ Plot.		East ½ Plot.		West ½ Plot.		West ½ Plot.		East ½ Plot.		East ½ Plot.		West ½ Plot.		West ½ Plot.		East ½ Plot.					
		Mangels, Mammoth Long Red—weight of roots.		Turnips, 2 varieties, Nos. 1 and 2—weight of roots.		Mangels, 3 varieties, Nos. 1, 2, 3—weight of roots.		Turnips, Carter's Elephant Swede—weight of roots.		Mangels. 3 varieties, Nos. 1, 2, 3—weight of roots.		Turnips, 6 varieties, Nos. 1, 2, 3, 4, 5, 6—weight of roots.		Mangels, Mammoth Long Red — weight of roots.		Turnips, Improved Purple Top Swede—weight of roots.		Mangels, Mammoth Long Red — weight of roots.		Turnips, Prize Purple Top Swede-weight of roots.		Mangels—weight of roots.		Turnips—weight of roots.	
		Per acre		Per acre		Per acre		Per acre		Per acre.		Per acre.		Per acre.		Per acre.		Per acre.		Per acre.		Per acre.		Per acre.	
		Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.
1	Barn-yard manure, well rotted, 20 tons per acre	19	340	16	1200	22	320	11	460	22	1220	9	1180	22	1900	9	1060	20	260	8	220	21	808	11	24
2	Barn-yard manure, fresh, 20 tons per ac.	17	1760	18	400	22	1740	12	580	21	1480	9	1100	21	200	13	1080	20	360	9	180	20	1508	12	1068
3	Unmanured	14	840	15	1000	11	780	5	160	6	1410	6	240	9	1020	6	580	7	360	2	1065	9	1682	7	209
4	Mineral phosphate, untreated, finely ground, 1,000 lbs. per acre	13		13	1600	10	760	6	1600	5	1690	5	560	8	720	9	520	7	220	2	1520	8	1878	7	1160
5	Mineral phosphate, untreated, finely ground, 1,000 lbs.; nitrate of soda, 250 lbs.; wood ashes, unleached, 1,000 lbs. per acre	16	1560	13	1300	14	1660	5	920	10	1370	4	1350	12	1440	9	1760	11	460	1	1760	13	498	7	218
6	Barn-yard manure partly rotted and actively fermenting, 12 tons per acre; mineral phosphate, untreated, finely ground, 1,000 lbs. composted together, intimately mixed and allowed to heat for several days before using	17	700	11	1800	19	1800	9	1580	19	1020	11	400	16	620	12	580	13	380	7	1720	17	504	10	1216
7	Mineral phosphate, untreated, finely ground, 1,000 lbs.; sulphate of potash, 200 lbs. in 1889 and 1890, substituted by muriate of potash, 250 lbs. in 1891 and subsequent years; nitrate of soda, 200 lbs. per acre	16	1500	12	900	12	360	10	1820	7	1210	3	580	8	1620	10	540	7	245	2	245	10	987	7	1617

8	Mineral superphosphate, No. 1, 500 lbs.; sulphate of potash, 200 lbs. in 1889 and 1890, substituted by muriate of potash, 250 lbs. in 1891 and subsequent years; nitrate of soda, 200 lbs. per acre	20	17 1300	15 1120	12 840	6 120	4 1360	17 60	10 1800	12 950	7 1150	14 450	10 1290
9	Mineral superphosphate, No. 1, 500 lbs. per acre	13 1600	13 600	9 780	9 400	8 1470	5 440	11 740	8 1460	5 1650	3 850	9 1648	7 1950
10	Nitrate of soda, 300 lbs. per acre	14 400	15 1100	13 1940	9 440	10 1880	3 860	17 1340	9 1120	13 165	1 1190	13 1945	7 1742
11	Sulphate of ammonia, 300 lbs. per acre	4 600	15 900	12 1440	11 1340	6 490	4 420	13 1060	9 1980	11 400	2 860	9 1200	8 1500
12	Unmanured	10 1900	14 1200	8 1000	10 1200	4 570	2 60	9 880	7 1340	3 1970	1 510	7 864	7 462
13	Bone, finely ground, 500 lbs.; wood ashes, unleached, 1,000 lbs. per acre	9 1800	12 1600	10 1540	12 520	6 840	2 890	12 120	6 1920	11 1640	2 580	10 388	7 702
14	Wood ashes, unleached, 2,000 lbs. per acre	13 200	13 800	13 740	10 1760	10 1600	1 1700	13 60	9 660	9 1520	2 1790	11 1824	7 1342
15	Common salt (sodium chloride), 400 lbs. per acre	13 400	14	12 960	12 480	11 830	3 680	11 220	7 1640	7 770	1 1950	11 836	7 1750
16	Mineral superphosphate, No. 1, 500 lbs.; nitrate of soda, 200 lbs. per acre	No crop	in 1889.	16 1400	20 320	12 830	6 1860	14 1000	8 840	12 680	3 1140	13 1977	9 1540
17	Mineral superphosphate, No. 1, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre	"	"	17 260	18 680	9 130	6 540	12 500	7 1440	11 750	2 680	12 910	8 1335
18	Mineral superphosphate No. 1, 500 lbs.; muriate of potash, 200 lbs. per acre	"	"	17 700	18 1360	11 1190	7 500	12 800	9 1140	10 1960	4 990	13 162	9 1997
19	Double sulphate of potash and magnesia, 300 lbs. per acre in 1889 and 1890; muriate of potash, 200 lbs., substituted each year since; dried blood, 250 lbs.; mineral superphosphate, No. 1, 500 lbs. per acre	"	"	18 1220	17 1960	11 1450	5 640	13 1600	9 600	13 1210	5 230	14 870	9 857
20	Wood ashes, unleached, 1,500 lbs.; common salt (sodium chloride), 300 lbs. per acre	"	"	17 40	18 880	15 350	6 1210	15 1500	9 420	12 580	4 70	15 117	9 1115
21	Mineral superphosphate, No. 2, 500 lbs. per acre	"	"	20 1680	17 1180	15 1870	5 1600	14 1720	9 800	14 370	5 1890	16 910	9 1397

the past three years the crop of turnips has been much diminished by the attack of a species of rot which has affected the roots when partly grown and resulted in rapid decay. This disease has been common on many farms in the Ottawa district, and no remedy has yet been discovered for it. It was hoped that change of seed might affect the crop favourably, but this seems to have no appreciable effect. During the past wet season the yield has been greatly reduced from this cause. From 4 to 6 lbs. of mangel seed and 6 lbs. of turnip seed is the quantity which has been used per acre each year, and both have been sown in rows $2\frac{1}{2}$ feet apart. The treatment of the land has been as follows: Ploughed in the autumn after the crop is gathered, disc-harrowed once in the spring, harrowed with smoothing harrow once, then ridged and sown. The land used for the turnips, which are usually sown later than the mangels, is allowed to stand after disc-harrowing, then cultivated once and ridged immediately before sowing. In 1889 the mangels were sown May 23rd, came up June 2nd and were pulled October 13th. The turnips were sown May 23rd, came up May 30th, were pulled October 14th. In 1890 mangels were sown May 21st, came up May 30th and were pulled October 15th. The dates of the sowing and coming up of the turnips for this year have been lost, but they were pulled October 16th. In 1891 mangels were sown May 16th, came up May 27th, pulled October 16th. Turnips were sown June 6th, came up June 11th, were pulled October 19th. In 1892, mangels were sown May 14th, came up May 24th and were pulled October 19th. Turnips were sown June 11th, came up June 16th, were pulled October 29th. In 1893, mangels were sown May 31st, came up June 7th, were pulled October 21st. Turnips were sown June 15th, came up June 20th and were pulled October 21st.

PLOTS OF CARROTS AND SUGAR-BEETS.

The plots of carrots and sugar-beets, consisting of $\frac{1}{20}$ acre each, were sown on alternate halves of the wheat, barley and oat plots for the purpose of cleaning the land from weeds. They were begun in 1891 and have been continued to the present. The plots after wheat and oats have been sown with a field carrot known as the Improved Short White. The plots after barley were sown in 1891 with 11 varieties of sugar-beet as stated in the table. The varieties were Dippe's Klein Wanzleben 4 rows, Bulteau Desprez 4 rows, Vaurica Yellow Giant 2 rows, Vilmorin's No. 1, 4 rows, Large Sugar 4 rows, Klein Wanzleben 4 rows, Vilmorin's Improved White 2 rows, Green Necked Brabant 2 rows, Vilmorins No. 2, 4 rows and 8 rows each of seed sent for test by Mr. A. Musy, of the Farnham Beet Sugar Factory designated I. B. and C. H. In 1892 the plots after barley were sown with the Guerande or ox-heart carrot and in 1893 with the Mammoth White Intermediate, a field carrot recently introduced. In 1891 the sugar-beets were sown 11th May, came up 26th May and were pulled 18th October. The carrots grown after wheat and oats, were sown 11th May came up 26th May and were pulled 29th October. In 1892 the carrots grown after barley were sown 11th May came up 26th May and were pulled 29th October; those after wheat were sown 6th May came up 20th May were pulled 31st October, and those after oats sown 6th May came up 20th May and were pulled 3rd November. In 1893 the carrots grown after barley were sown 30th May came up 7th June and were pulled 23rd October; those after wheat and oats were sown 30th May came up 6th June and were pulled 23rd and 24th October.

These plots have given fairly uniform returns varying but slightly from what might have been expected from the fertilizers used. The sugar-beets on several of the plots in 1891 were partly destroyed by cut-worms which will account for unexpected variations in yields that year. The carrots after oats also suffered similar injury that season. On plots 18, 19, 20 and 21 after oats, the soil is heavier than on the other plots and less suitable for carrots which will in part account for the relatively smaller yield on these plots as compared with those after wheat.

EXPERIMENTS with Fertilizers on Half-Plots of Carrots and Sugar Beets, $\frac{1}{20}$ acre, after Wheat, Barley and Oats.

No. of Plot.	Manure applied each Year.	1st Season, 1891.						2nd Season, 1892.						3rd Season, 1893.						Average Yield of Carrots.			
		East ½ Plot.		West ½ Plot.		East ½ Plot.		West ½ Plot.		East ½ Plot.		West ½ Plot.		East ½ Plot.		West ½ Plot.		East ½ Plot.		Improved Short White for three years.			
		Carrots, Improved Short White, after wheat—yield of roots.		Sugar Beets, 11 varieties, after barley—yield of roots.		Carrots, Improved Short White, after oats—yield of roots.		Carrots, Improved Short White, after wheat—yield of roots.		Carrots, Guerande or Ox-Heart, after barley—yield of roots.		Carrots, Improved Short White, after oats—yield of roots.		Carrots, Improved Short White, after wheat—yield of roots.		Carrots, Mam. White, Intermediate, after barley—yield of roots.		Carrots, Improved Short White, after oats—yield of roots.		After wheat—yield of roots.		After oats—yield of roots.	
		Per acre		Per acre		Per acre		Per acre		Per acre		Per acre		Per acre		Per acre		Per acre		Per acre		Per acre	
		Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.
1	Barn-yard manure, well rotted, 15 tons per acre	27	600	18	1390	23	1600	20	940	16	1800	20	940	19	80	21	200	15	850	22	1207	19	1797
2	Barn-yard manure, fresh, 15 tons per acre	29	600	17	1120	26	1300	21	900	16	1660	19	640	20	550	20	90	16	1230	24	17	20	1723
3	Unmanured	22	....	8	870	15	500	14	1280	12	1080	12	180	15	40	14	1940	10	280	17	440	12	987
4	Mineral phosphate, untreated, finely ground, 500 lbs. per acre	21	1600	7	130	16	900	14	1400	12	1820	12	1060	14	1570	12	630	9	1850	17	190	12	1937
5	Mineral phosphate, untreated, finely grouud, 500 lbs.; nitrate of soda, 200 lbs. per acre	25	1020	13	1540	20	1400	16	1240	14	1880	15	1240	17	10	15	1500	12	1870	19	1423	16	833
6	Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre; mineral phosphate, untreated, finely ground, 500 lbs. per acre, composted together, intimately mixed and allowed to heat for several days before using	31	600	16	1840	28	800	18	1400	16	1980	18	1940	18	1720	21	1050	13	120	22	1907	20	287
7	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre	18	1000	11	1190	24	200	17	440	15	1060	18	200	14	1830	15	1900	15	660	16	1757	19	353
8	Mineral phosphate, untreated, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre	11	800	9	360	19	400	15	1440	14	40	16	1900	12	1680	15	1300	12	820	13	640	16	373
9	Mineral superphosphate, No. 1, 500 lbs. per acre	10	600	11	900	17	1500	15	1640	15	1780	15	80	11	390	16	270	9	740	12	877	14	107
10	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs. p.a.	21	800	13	1440	15	460	18	440	13	1740	14	580	13	390	18	330	12	280	14	543	13	1773
11	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,500 lbs. per acre	25	1800	13	120	6	1940	19	1300	17	1320	12	1880	15	330	17	170	12	1150	20	477	10	990
12	Unmanured	23	600	8	510	6	1900	14	1600	11	400	10	1200	14	1870	13	960	7	550	17	1357	8	550
13	Bone, finely ground, 500 lbs. per acre	21	1000	8	400	6	700	16	1820	10	1960	11	340	16	500	14	1910	8	1490	18	440	8	1510
14	Bone, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. p. ac.	24	800	10	1630	13	..	20	1980	14	500	15	....	19	1330	17	1310	16	950	21	1370	13	1650
15	Nitrate of soda, 200 lbs per acre	22	400	15	555	19	1800	20	620	13	1860	20	20	18	170	14	580	17	500	20	397	19	107
16	Muriate of potash, 150 lbs. per acre	22	1400	8	1460	17	....	18	80	14	800	20	1280	18	1990	17	1500	15	1260	19	1823	17	1513
17	Sulphate of ammonia, 300 lbs. per acre	16	700	11	40	12	800	15	1220	12	1700	18	960	12	1430	15	750	13	760	14	1783	15	173
18	Sulphate of iron, 60 lbs. per acre	19	1000	10	1760	15	260	13	1900	9	1740	13	1720	14	740	16	250	11	380	15	1884	13	787
19	Common salt (sodium chloride), 300 lbs. per acre	20	1600	12	1580	17	260	15	1740	13	1440	18	620	14	870	15	1560	15	280	17	70	17	53
20	Land plaster or gypsum (calcium sulphate), 300 lbs. per acre	20	1200	11	295	18	460	18	1180	12	1680	19	1600	14	720	18	1790	13	870	17	1700	17	310
21	Mineral superphosphate, No. 2, 500 lbs. per acre	21	200	10	1895	17	800	14	1240	13	720	18	1260	12	1580	17	210	11	1950	15	340	16	3

GENERAL CONSIDERATIONS.

While a period of six years in the testing of the effects of manures on crops is altogether too short to permit of drawing positive conclusions on any point, yet when a considerable degree of uniformity is found in the results throughout the series they may justify an experimenter in calling special attention to them.

The results obtained from plots 1 and 2 throughout the whole series in uniformly large average returns serves to confirm the correctness of the view generally held as to the beneficial action of barn-yard manure. It is, however, worthy of note in this connection, that in its application to wheat, barley and oats, manure used fresh from the barn has produced a higher average of grain than an equal weight of manure which has been well rotted. In the barley plots the fresh manure also gives a heavier weight of straw, while in the oat and wheat plots the advantage, as far as the crop of straw is concerned, is slightly in favour of the rotted manure. On the corn plots the fresh manure has given much the heavier crops on the No. 1 series, while the rotted manure has a slight advantage in No. 2. In the case of the roots the advantage is on the side of the rotted manure with the mangels, with the sugar beets grown in 1891, and with the carrots after barley in 1892; but the fresh manure gives the larger returns with the turnips, also with all the crops of carrots after wheat and oats and with the carrots after barley in 1893. These facts when carefully compared indicate a considerable advantage thus far in the use of fresh manure over that of rotted weight for weight, which is a most important point in the economy of manures, since, during the process of rotting, mannure loses about 40 per cent of its weight, and to this loss must be added the cost of twice handling, and usually that of turning once or twice during the process of fermentation. The explanation of this rather unlooked for result, probably lies in the fact that the liquid portions of the manure, the richest in nitrogen, have much of their most valuable constituent volatilized and lost during the process of rotting.

The unmanured plots, Nos. 3 and 12, show fairly uniform results throughout, the slight differences being easily explained by variation in soil.

The crops given by plot 4 in all the series seem to show that mineral phosphate untreated no matter how finely ground has little or no effect as a fertilizer, and that the effects observable where nitrate of soda and wood ashes are used in conjunction with the untreated mineral phosphate are probably due entirely to the action of these added fertilizers. There is however no doubt that the mineral phosphate when treated with sulphuric acid and rendered soluble by being changed to the superphosphate is a most valuable addition to the fertilizing constituents of the soil.

It would appear that, when the finely ground mineral phosphate is intimately mixed with barn-yard manure in an active state of fermentation and composted for several days, better results are obtained than would be expected from the proportion of manure used and it is probable that under these circumstances some portion of the mineral phosphate is rendered soluble by the action of the ferments in the decaying manure.

The addition of highly nitrogenous fertilizers, such as nitrate of soda and sulphate of ammonia, while usually producing a fair increase in the weight of grain, has a more marked effect on the weight of straw, which is increased very considerably.

It is somewhat singular that the inferior quality of superphosphate of lime known as No. 2 has given in nearly all the tests better average results than have been obtained from the use of the more costly No. 1 quality: no explanation can yet be offered for this unlooked for result.

The experiments with the use of common salt alone, and land plaster or gypsum alone, have resulted in better average yields than was expected. These results are most probably due in large measure to the influence which both these substances exert in liberating potash in the soil, by reducing insoluble potash compounds to soluble forms and also of influencing the texture of the soil so as to enable it to retain more moisture. The use of salt alone seems to be specially beneficial to the barley crop. The tests made with sulphate of iron on grain crops have also given better results on the average than was looked for.

Some of the less favourable results obtained from the use of artificial fertilizers which from the nature of their constituents are known as complete fertilizers are unexpected and disappointing and cannot at present be explained. In all probability the experience of a few more years will throw further light on the subject.

DISTRIBUTION OF SEED GRAIN.

This useful department of the work of the experimental farms has demanded increased attention during the past year in consequence of the very large number of applications which have been received from all parts of the Dominion. This gratifying appreciation of the value of this distribution of useful varieties of seed grain, while manifest in most of the provinces has been most marked in the province of Quebec. 11,113 samples of 3 lbs. each were sent to this province, an increase of 2,596 over last year, and there still remained at the close of the distribution two or three thousand applications which had been received late and which could not be supplied, as the available stock of good grain was exhausted. To nearly all the provinces of the Dominion the number of samples sent from Ottawa in 1893 was in excess of any previous year. There was a slight falling off in the number sent to the North-west Territories, also to British Columbia. This apparent deficiency has been partly if not wholly made up by the larger quantity of samples sent to farmers direct from the experimental farms in the North-west Territories and British Columbia. At all the branch farms a distribution of such samples now takes place annually to the great satisfaction of the farmers in the provinces and territories where these institutions are located. It is highly desirable that all applications for samples of seed grain should be made as early in the year as practicable, if delayed there is much greater difficulty in meeting the wishes of applicants. The distribution consists mainly of samples of the principal cereals and not more than two are sent to any one applicant. No seeds of field roots, garden vegetables or flowers are supplied.

The samples sent out during the early months of 1893 were distributed as follows:—

Prince Edward Island.

Oats	150
Barley	133
Wheat	131
Pease	21
Indian corn	67
Potatoes	17
	519

Number of applicants supplied 281.

Nova Scotia.

Oats	486
Barley	460
Wheat	254
Pease	65
Indian corn	278
Potatoes	81
	1,624

Number of applicants supplied 860.

New Brunswick.

Oats	476
Barley	425
Wheat	351
Pease	154
Indian corn	353
Potatoes	55
	1,814

Number of applicants supplied 1,024.

Ontario.

Oats	1,516
Wheat	956
Barley	940
Pease	476
Potatoes	289
Indian corn	283
	4,460

Number of applicants supplied 2,261.

Quebec.

Barley	3,338
Oats	2,809
Wheat	2,663
Pease	620
Indian corn	1,385
Potatoes	298
	11,113

Number of applicants supplied 6,416.

Manitoba.

Oats	267
Wheat	183
Barley	179
Pease	84
Indian corn	176
Potatoes	19
	908

Number of applicants supplied 507.

North-west Territories.

Oats	256
Barley	167
Wheat	148
Pease	69
Indian corn	75
Potatoes	26
	741

Number of applicants supplied 382.

British Columbia.

Oats	71
Wheat	58
Barley	44
Pease	20
Indian corn	5
	198

Number of applicants supplied 100.

The following list shows the number of three-pound packages of the different varieties which have been distributed:—

Oats.

Banner	2,471
Prize Cluster	1,454
White Wonder	787
Holstein Prolific	702
Improved Ligowo	345
Abundance	161
Rosedale	111
	6,031

Barley—Two-rowed.

Duck-bill	1,594
Kinver Chevalier	1,142
Danish Chevalier	733
Prize Prolific	672
Goldthorpe	547
Canadian Thorpe	249
	4,937

Barley—Six-rowed.

Baxter's Six-rowed	505
Rennie's Improved	199
Oderbruch	45
	749

Wheat.

Campbell's White Chaff	1,813
Ladoga	1,005
Red Fife	695
White Fife	361
White Connell	311
Rio Grande	292
Campbell's Triumph	149
Red Fern	118
	4,744

Pease.

Mummy	1,509

Indian Corn.

Rural Thoroughbred White Flint	773
Pearce's Prolific	722
Longfellow	716
North Dakota	411
	2,622

Potatoes.

Thorburn	257
Lee's Favourite	241
Early Ohio	171
Wonder of the World	74
Beauty of Hebron	42
	785
Total number of samples distributed	21,377
Number of applicants supplied	11,831

Since it has been found necessary to close the operations to be reported on for this year earlier than in the past, so that the annual report might be prepared and distributed in good season, the usual summary of the reports received from those to whom the samples were sent is necessarily omitted.

TESTING THE VITALITY OF GRAIN AND OTHER SEEDS.

During the past season the vitality of 1,957 samples of seed grain and agricultural seeds has been tested at the Central Experimental Farm and reported on. These have been received from almost every part of the Dominion and the results have conveyed to the farmers, who have sent them for test, much useful infor-

mation. As will be seen in the appended table the 613 samples of wheat tested have varied much, from those perfect in germinating proportion to such as had entirely lost the power of germinating. The 383 samples of barley have varied in vitality from 100 to 22 per cent, and the 744 samples of oats tested from 100 to as low as 4 per cent. The average vitality of all the samples is a little below the average of last year.

The season of 1893 has in many sections been unfavourable for the perfect development of grain, and in some districts very wet weather occurred preceding and during harvest time, causing discolouration of the grain and in some instances mouldiness and sprouting in the field. It is important that farmers residing in districts where the conditions have been unfavourable should forward for test such samples concerning which any doubts as to vitality and usefulness for seed may exist. Samples sent for testing should not weigh less than one ounce, they can be sent to the Central Experimental Farm, at Ottawa, free through the mail, and in order that the returns may all be made before the time of seeding arrives they should be forwarded as early as practicable.

RESULTS of Tests for 1892–93.

Kind of Seeds.	Number of Tests.	Highest Percentage.	Lowest Percentage.	Percentage of Strong Growth.	Percentage of Weak Growth.	Average Vitality.
Wheat	613	100·0	0·0	70·6	11·2	81·8
Barley	383	100·0	22·0	61·8	23·1	84·9
Oats	744	100·0	4·0	82·6	10·4	93·0
Rye	8	95·0	79·0			88·6
Pease	35	100·0	12·0			65·7
Corn	22	100·0	6·0			70·9
Clover	6	81·0	10·0			61·3
Grass	5	91·0	23·0			54·2
Beans	5	96·0	64·0			78·4
Sunflowers	9	96·0	78·0			85·8
Turnips	14	96·0	35·0			73·0
Mangels	5	84·0	14·0			32·4
Beets	6	46·0	28·0			37·0
Carrots	11	52·0	8·0			31·3
Cabbage	13	94·0	21·0			76·2
Cauliflower	3	82·0	61·0			69·0
Onions	7	88·0	15·0			53·5
Tomatoes	11	76·0	9·0			49·1
Radish	9	80·0	8·0			43·5
Parsnips	4	56·0	0·0			22·5
Celery	6	65·0	25·0			42·6
Pepper	3	53·0	1·0			23·6
Lettuce	2	89·0	82·0			85·5
Spinach	2	38·0	28·0			33·0
Cucumber	6	56·0	0·0			30·0
Musk melon	2	32·0	28·0			30·0
Water melon	2	36·0	10·0			23·0
Flax	2	90·0	59·0			74·5
Thyme	2	15·0	0·0			7·5
Sweet marjoram	2	12·0	12·0			12·0
Sage	2	47·0	0·0			23·5
Summer savory	2	33·0	0·0			16·5
Tobacco	1					66·0
Pumpkins	1					4·0
Leek	1					6·0
Endive	1					54·0
Tares	1					97·0
Asparagus	2					0·0
Tree seeds	4					0·0
Total tumber of samples tested, highest and lowest percentage and average vitality	1,957	100·0	0·0			83·8

EXPERIMENTS WITH FALL WHEAT.

During the past season twelve varieties of fall wheat have been tested varying in size from about $\frac{1}{20}$th to $\frac{1}{2}$ acre. The land on which they were sown was a sandy loam of medium quality. It received a fair coat of barn-yard manure in the spring of 1892, was lightly ploughed to cover the manure and sown with oats. After the oats were harvested the land was immediately gang ploughed to start shed grain and weed seeds and ploughed again and harrowed in September before the wheats were sown. The plots were all sown on September 9th, and the results are given in the appended table.

Name of variety,	Length of straw.	Character of straw.	Length of head.	Kind of head.	Date of ripening.	Yield per acre.	Weight per bushel.	Proportion rusted.
	Inches.		Inches.			Bush. lbs.		
Manchester......	40 to 45	Stiff......	$2\frac{1}{2}$ to $3\frac{1}{2}$	Beardless	July 24...	24 03	$57\frac{3}{4}$	Considerably.
Early Red Clawson	35 to 40	do	3 to $3\frac{1}{2}$	do ..	do 24...	20 38	$58\frac{1}{4}$	do
Martin's Amber...	40 to 43	do	$2\frac{1}{2}$ to $3\frac{1}{2}$	do ..	do 24...	18 37	$58\frac{1}{2}$	Badly.
Jones' Winter Fife.	46 to 48	do	3 to $3\frac{1}{2}$	do ..	do 24...	18 36	54	do
Robert's (Carman's No. 3)	40 to 42	do	3 to $3\frac{1}{2}$	Bearded..	do 22...	18 33	$55\frac{3}{4}$	do
Willit's (Carman's No. 2)	42 to 45	do	3 to $3\frac{1}{2}$	Beardless.	do 24...	17 42	$53\frac{1}{4}$	do
Democrat.........	46 to 48	Fair..	3 to $3\frac{1}{2}$	Bearded..	do 24...	17 23	$56\frac{1}{2}$	do
Johnson (Carman's No. 55)...... ...	40 to 42	do	3 to $3\frac{1}{4}$	do ..	do 24...	16 50	53	do
Stewart (Carman's No. 51)..........	45 to 48	Stiff.. ...	3 to $3\frac{1}{2}$	do ..	do 24...	16 50	54	do
Tasmania	40 to 42	Fair.. ...	3 to $3\frac{1}{2}$	do ..	do 22...	15 26	58	V'ry badly
Golden Cross......	40 to 42	do	3 to $3\frac{3}{4}$	do ..	do 22...	14 34	$58\frac{3}{4}$	do
Welds No. 4	40 to 45	do	$3\frac{1}{2}$ to 4	do ..	do 24...	12 42	$56\frac{1}{4}$	do

EXPERIMENTS WITH SPRING WHEAT $\frac{1}{20}$TH ACRE PLOTS.

There were tested during 1893, thirty-two varieties of spring wheat. These were sown on clay loam, the previous crop was hay. The land was ploughed in the summer of 1892, shortly after the removal of the hay crop, ploughed a second time late in the autumn and gang ploughed and harrowed in the spring before sowing. It was intended to sow all the plots the same day, but owing to unfavourable weather this was found to be impracticable, a part were sown on May 26th and part on the 27th. The particulars of growth will be found in the appended table, and it will be observed that the yield of most sorts was unusually light, a result brought about mainly by rust, from which all varieties suffered. Rust first appeared on the leaves of the spring wheat during the second week in July, and gradually spread to the stems, and by the end of the month it showed itself in a very marked degree, the earlier ripening varieties being most affected. About the middle of August the earlier sorts were cut, but in every instance the yield was poor and the grain was small and did not reach its usual condition of maturity. The harvest weather was also bad and rain fell on an average every second day during August and the first week of September, the total rainfall during this period being over nine inches. Under such conditions it was impossible to save the crop satisfactorily, and after it was cut it was several weeks before it could be dried and housed. In the meantime it was found necessary to untie and spread the sheaves and tie again several times, and with so much handling much of the grain was unavoidably shed; on this account the comparison of varieties as to yield and quality is not of much value this year.

TEST OF VARIETIES OF WHEAT SOWN MAY 26TH AND 27TH.

Name of variety.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Date of Ripening.	Number of days Maturing.	Yield per Acre.		Weight per Bushel.	Proportion Rusted.
	Inches.		Inches.				Bus.	lbs.		
Herison's Bearded	36 to 42	Stiff	$1\frac{1}{4}$ to 2	Bearded	Aug. 23	89	25	00	56	Considerably.
Preston	42 to 46	do	$2\frac{1}{2}$ to $3\frac{1}{2}$	do	do 22	88	20	20	$57\frac{3}{4}$	do
Dions (resembles Red Fern)	46 to 48	Fair	3 to 4	do	do 30	95	18	00	$58\frac{3}{4}$	Slightly.
Pringle's Champlain	42 to 51	do	3 to 4	do	do 26	91	17	40	$54\frac{3}{4}$	Badly.
Wellman's Fife	36 to 52	Stiff	$2\frac{3}{4}$ to $3\frac{3}{4}$	Beardless	do 28	93	16	02	$55\frac{1}{4}$	Considerably.
Crown	42 to 48	do	$2\frac{3}{4}$ to $3\frac{1}{2}$	Bearded	do 23	88	16	00	$55\frac{3}{4}$	do
Red Fife	40 to 48	do	$2\frac{1}{2}$ to 3	Beardless	do 28	94	14	20	55	do
Beaudry	36 to 42	Fair	$2\frac{1}{2}$ to 3	Bearded	do 23	88	14	20	58	do
Stanley	43 to 48	Stiff	$2\frac{1}{2}$ to $3\frac{1}{2}$	Beardless	do 22	88	13	50	$56\frac{1}{4}$	do
Red Fern	47 to 52	Fair	3 to 4	Bearded	do 30	95	13	40	$55\frac{3}{4}$	do
Alpha	42 to 48	Stiff	$2\frac{1}{2}$ to $3\frac{1}{2}$	Beardless	do 23	89	13	20	57	do
White Russian	42 to 49	Fair	$2\frac{3}{4}$ to $3\frac{1}{4}$	do	do 23	88	13	00	53	do
White Fife	36 to 44	Stiff	$2\frac{1}{2}$ to $3\frac{1}{2}$	do	do 28	93	12	30	55	do
Ottawa	36 to 44	Fair	$2\frac{3}{4}$ to $3\frac{1}{2}$	Bearded	do 15	80	11	40	$50\frac{1}{4}$	Badly.
Abundance	41 to 46	do	$2\frac{1}{2}$ to $3\frac{1}{4}$	do	do 17	82	10	40	53	do
Rio Grande	46 to 53	Stiff	3 to 4	do	do 31	96	10	20	$53\frac{3}{4}$	do
Black Sea	36 to 45	Fair	$2\frac{1}{2}$ to $3\frac{1}{2}$	do	do 15	80	10	20	51	do
Albert	36 to 48	do	$2\frac{3}{4}$ to $3\frac{1}{2}$	do	do 15	81	10	00	50	do
Ladoga	36 to 45	do	$2\frac{1}{4}$ to $3\frac{1}{4}$	do	do 16	81	9	40	50	do
Hungarian Mountain	36 to 42	Stiff	$2\frac{3}{4}$ to $3\frac{1}{2}$	Beardless	do 28	94	9	40	$51\frac{1}{4}$	do
Huestons	38 to 48	Fair	3 to 4	do	do 25	91	9	30	$47\frac{3}{4}$	do
Great Western	40 to 52	Stiff	3 to 4	Bearded	do 31	96	9	10	50	do
Prince	36 to 45	Fair	$2\frac{3}{4}$ to $3\frac{1}{2}$	do	do 15	80	8	50	51	do
Carleton	36 to 45	do	$2\frac{3}{4}$ to $3\frac{1}{2}$	do	do 15	80	8	40	$59\frac{3}{4}$	do
Beta	40 to 45	do	$2\frac{1}{2}$ to $3\frac{1}{4}$	do	do 19	84	8	20	52	do
Manitou (not distinguishable from Red Fife)	42 to 48	Stiff	3 to 4	Beardless	do 28	93	7	40	$49\frac{1}{4}$	do
White Chaff	36 to 45	Fair	$2\frac{1}{2}$ to 3	do	do 20	85	7	00	48	do
Colorado	36 to 47	Weak	$2\frac{1}{2}$ to $3\frac{1}{4}$	Bearded	do 19	85	6	20	57	Very badly.
Azima, Russian	33 to 48	do	3 to $4\frac{1}{4}$	do	Sept. 1	98	5	30	$52\frac{1}{4}$	Badly.
White Connell	40 to 48	Fair	$2\frac{1}{2}$ to 3	Beardless	Aug. 27	93	5	27	44	do

FIELD CROPS OF SPRING WHEAT.

Rio Grande.—Soil part sandy loam and part clay loam. The previous crop was barley on the sandy loam, and corn on the clay. The land was ploughed in the autumn of 1892, disc harrowed and harrowed with the smoothing harow in spring of 1893 before sowing; $3\frac{1}{2}$ acres sown May 15th, $1\frac{1}{2}$ bushels per acre, ripe August 27th; time to mature, 104 days; yield per acre, 20 bushels, 50 lbs., weight per bushel, $55\frac{1}{4}$ lbs.; length of head, $3\frac{3}{4}$ to 4 inches; bearded, length of straw, 48 to 50 inches, all standing well and rusted, but not so badly as other varieties.

Wellman's Fife—Soil, sandy loam; previous crop, oats; ploughed in autumn of 1892, gang ploughed in spring of 1893, and harrowed with smoothing harrow before sowing, 1 acre, sown May 13th, $1\frac{1}{2}$ bushels per acre, ripe August 22nd, time to mature, 101 days, yield per acre, 13 bushels, 37 lbs., weight per bushel, $53\frac{1}{2}$ lbs.; length of head, 3 to $3\frac{3}{4}$ inches, beardless, length of straw, 36 to 42 inches, straw stiff, all standing well, but considerably rusted.

Campbell's White Chaff.—On clay soil, the previous crop was corn. The land was ploughed in the autumn of 1892, had a light coating of manure, 10 to 12 tons per acre in the spring of 1893, then ploughed lightly and harrowed with smoothing harrow before sowing, $2\frac{1}{7}$ acres, sown May 22nd, $1\frac{1}{2}$ bushels per acre, ripe August 22nd, time to mature, 92 days, yield per acre, 10 bushels, 3 lbs., weight per bushel, 54 lbs. Length of head, $2\frac{1}{2}$ to 3 inches, beardless, length of straw, 34 to 40 inches, considerably broken down and very badly rusted.

EXPERIMENTS WITH BARLEY.

Twelve varieties of 2-rowed barley, and 12 varieties of 6-rowed were tested for comparative earliness and yield during the past season on plots of $\frac{1}{20}$ acre each. It was intended to sow these all on the same day, but heavy rains prevented this and the sowing of some of the plots was unavoidably delayed for two days. These plots were adjoining those of the spring wheat on similar clay loam, and the land received the same treatment.

The barley was not nearly so much affected by rust as the wheat was, but it was apparent on the leaves about the same time. It appeared on the stems of the 6-rowed sorts about the last of July, and on the 2-rowed a week later, the 6-rowed varieties were not much injured, but the 2-rowed sorts suffered considerably.

TWO-ROWED BARLEY—TEST OF VARIETIES.

Name of variety.	Length of Straw.	Character of Straw.	Length of Head.	Date of Sowing.	Date of Ripening.	Number of days Maturing.	Yield per Acre.		Weight per Bushel.	Proportion Rusted.
	Inches.		Inches.				Bus.	lbs.	Lbs.	
Thanet..................	36 to 39	Weak	$3\frac{1}{2}$ to $4\frac{1}{2}$	May 29	Aug. 20	83	40	40	$43\frac{3}{4}$	Slightly.
Swedish female, with Baxter's six-rowed, male, plant 3......	24 to 36	Fair..	$2\frac{1}{2}$ to $3\frac{1}{2}$	do 29	do 13	76	30	10	$49\frac{3}{4}$	do
Improved Chevalier...........	33 to 39	Weak	$2\frac{3}{4}$ to $3\frac{1}{2}$	do 29	do 19	82	30	..	$45\frac{3}{4}$	Considerably.
French Chevalier..	32 to 39	do	$3\frac{1}{2}$ to 5	do 29	do 23	86	27	14	44	Slightly.
Kinver Chevalier..............	36 to 39	do	4 to 5	do 29	do 22	85	20	20	43	do
Newton..........	32 to 41	Stiff ..	$2\frac{3}{4}$ to $3\frac{1}{4}$	do 27	do 25	90	19	11	$43\frac{1}{4}$	Considerably.
Danish Chevalier..............	30 to 37	Weak	$3\frac{1}{2}$ to 5	do 29	do 26	89	18	36	$44\frac{1}{2}$	do
Duck-bill.......	30 to 36	Stiff ..	$2\frac{1}{2}$ to 3	do 27	do 21	86	18	16	...	Slightly.
New Golden Grains...........	36 to 39	Weak	4	do 29	do 22	85	17	44	$41\frac{3}{4}$	do
Canadian Thorpe.............	30 to 33	Stiff ..	$2\frac{1}{2}$ to $3\frac{1}{4}$	do 27	do 23	88	15	40	44	Considerably.
Prize Prolific......	24 to 38	Weak	$2\frac{3}{4}$ to $3\frac{1}{4}$	do 29	do 26	89	15	40	$43\frac{1}{2}$	do
Goldthorpe....................	32 to 36	Fair ..	$2\frac{3}{4}$ to $3\frac{1}{4}$	do 27	Sept. 9	104	12	34	44	do

SIX-ROWED BARLEY.—TEST OF VARIETIES.

Name of variety.	Length of Straw.	Character of Straw.	Length of Head.	Date of Sowing.	Date of Ripening.	Number of days Maturing.	Yield per Acre.		Weight per Bushel.	Proportion Rusted.
	Inches.		Inches.				Bus.	lbs.	Lbs.	
Mensury......................	31 to 44	Fair ..	$2\frac{3}{4}$ to $3\frac{3}{4}$	May 29	Aug. 10	73	47	24	$46\frac{3}{4}$	Slightly.
Swedish female, with Baxter's six-rowed male, garden type.	30 to 34	Stiff ..	2 to 3	do 27	do 11	76	44	28	$47\frac{3}{4}$	do
Common six-rowed............	33 to 42	Fair ..	$2\frac{1}{4}$ to 3	do 27	do 6	71	41	32	$48\frac{3}{4}$	do
Odessa.........................	28 to 33	do	$2\frac{1}{2}$ to 3	do 29	do 11	74	38	26	46	do
Summit.........	33 to 36	do	$2\frac{1}{2}$ to $3\frac{1}{4}$	do 27	do 11	76	35	..	$48\frac{3}{4}$	do
Rennie's Improved..	33 to 41	Stiff ..	2 to 3	do 29	do 8	71	34	8	$48\frac{3}{4}$	do
Baxter's female, with another barley male, name lost......	34 to 40	Fair ..	2 to $2\frac{3}{4}$	do 27	do 8	73	33	16	48	do
Baxter's.......................	33 to 38	do	2 to $2\frac{3}{4}$	do 27	do 9	74	29	8	$48\frac{1}{2}$	do
Surprise.......................	31 to 36	Stiff ..	2 to 3	do 27	do 12	77	28	14	47	do
Oderbruch.......	30 to 39	do	$2\frac{1}{2}$ to 3	do 29	do 9	72	25	40	$48\frac{3}{4}$	do
Guaymalaye Hulless	24 to 36	Weak	3 to $3\frac{1}{2}$	do 29	do 19	82	16	12	$49\frac{1}{2}$	do
Petschora......................	30 to 36	Fair ..	$2\frac{3}{4}$ to $3\frac{1}{2}$	do 29	do 8	71	15	40	$43\frac{3}{4}$	do

FIELD CROPS OF BARLEY.

Duck-bill, Two-rowed.—On sandy loam; previous crop was vegetables; ploughed in spring of 1893, and harrowed with smoothing harrow before sowing, $2\frac{1}{8}$ acres; sown May 12th, $1\frac{3}{4}$ bushels per acre; ripe, August 7th; time to mature, 87 days; yield per acre, 22 bushels, 15 lbs.; weight per bushel, $42\frac{3}{4}$ lbs.; length of head, $3\frac{1}{2}$ to $3\frac{3}{4}$ inches; length of straw, 39 to 43 inches, all standing well but considerably rusted; no smut.

Oderbruch, Six-rowed.—On light sandy loam; previous crop was corn; land ploughed in autumn of 1892; gang-ploughed in spring of 1893, and harrowed before sowing; 2 acres; sown May 31st; $1\frac{3}{4}$ bushels per acre; ripe, August 10th; time to mature, 71 days; yield per acre, 22 bushels 19 lbs.; weight per bushel, $46\frac{1}{4}$ lbs.; length of head, $2\frac{1}{2}$ to 3 inches; length of straw, 28 to 30 inches; all standing well, but rusted considerably; a very few heads of smut.

Baxter's Six-rowed.—On light sandy loam; previous crop was corn; ploughed in autumn of 1892; gang ploughed in spring of 1893, and harrowed before sowing; 1 acre; sown, May 31st; $1\frac{3}{4}$ bushels per acre; ripe, August 10th; time to mature, 71 days; yield per acre, 14 bushels, 33 lbs.; weight per bushel, 48 lbs.; length of head, 2 to $2\frac{1}{2}$ inches; length of straw, 30 to 32 inches; all standing well; a considerable quantity of smut, and more or less rust.

Rennie's Improved Six-rowed.—This was grown alongside of Baxter's six-rowed, on similar soil; the preparation of the land was the same; $2\frac{1}{4}$ acres; sown, May 31st; $1\frac{3}{4}$ bushels per acre; ripe, August 11th; time to mature, 72 days; yield per acre, 19 bushels, 33 lbs.: weight per bushel, $47\frac{1}{4}$ lbs.; length of head, $2\frac{1}{2}$ to 3 inches; length of straw, 32 to 36 inches; all standing well; very little smut, but somewhat rusted.

EXPERIMENTS WITH OATS.

The rust which struck the wheat and barley about the middle of July affected the oats to a much greater extent, spreading over leaves, stems and panicles, and exhausting the plants to such a degree that early in August, in most cases, all growth appeared to have ceased, and the grain dried up prematurely; comparatively few of the kernels filled, and the crop for the greater part was very light both in yield and weight of grain. To publish particulars of such results would only tend to mislead, as no satisfactory evidence could be gained of relative earliness or yield under such conditions. In many instances those oats grown on the heaviest and best soils, which under ordinary conditions would have given good returns, gave the poorest results. The best yield was from a field of a variety known as Abundance, which gave 36 bushels 11 lbs. per acre, weighing $33\frac{1}{4}$ lbs. per bushel, while the same variety grown on a heavier and better soil was so eaten up with rust that it gave only 11 bushels 11 lbs. per acre, weighing 20 lbs. per bushel.

SPRAYING FOR RUST.

About the time when the rust began to appear one-half of a large number of experimental plots of oats and wheat were carefully sprayed from top to bottom with the usual solution of copper carbonate, and on some of the plots the spraying was tried a second time but there was no perceptible difference between the sprayed and unsprayed portions, the remedy seemed to have no influence in staying the progress of the rust.

EXPERIMENTS WITH PEASE.

Twelve varieties of pease were sown on plots of $\frac{1}{10}$th of an acre each as a test of relative earliness and productiveness. All were sown on 29th May, and in the following table will be found the particulars of the results obtained. The soil was clay loam, adjoining the $\frac{1}{10}$th acre plots of barley, and had similar preparation.

TEST OF VARIETIES OF PEASE.

Name of variety.	Date of Ripening.	No. of days Maturing.	Yield per Acre.		Weight per Bushel.
			Bush.	Lbs.	Lbs.
Canadian Beauty	Sept. 1	95	34	40	$61\frac{3}{4}$
Prussian Blue	Aug. 30	93	33	30	$62\frac{3}{4}$
Prince Albert	Sept. 2	96	29	..	$62\frac{1}{4}$
Pride	Aug. 21	84	27	50	62
Large White Marrowfat	do 30	93	26	20	$61\frac{1}{4}$
Centennial	do 25	88	25	10	$61\frac{1}{2}$
Black-eyed Marrowfat	do 30	93	24	..	$60\frac{1}{2}$
Crown	do 28	91	23	20	$62\frac{1}{4}$
Multiplier	do 30	93	22	50	$62\frac{1}{2}$
New Potter	do 30	93	22	50	61
Mummy	do 23	86	22	40	62
Golden Vine	do 28	91	18	20	$61\frac{1}{2}$

OTHER PLOTS OF PEASE.

Canadian Beauty.—Sown on light sandy loam, previous crop was oats; ploughed in autumn of 1892, gang-ploughed and harrowed in spring of 1893, $\frac{1}{18}$ acre. Sown May 27th, $2\frac{1}{2}$ bushels per acre, ripe August 25th, time to mature, 90 days, yield per acre, 35 bushels, weight per bushel, $61\frac{1}{4}$ lbs.

New Potter.—Adjoining Canadian Beauty on similar soil with same treatment $\frac{1}{18}$ acre, sown May 27th, $2\frac{1}{2}$ bushels per acre, ripe August 25th, time to mature 90 days, yield per acre, 30 bushels 49 lbs., weight per bushel, $62\frac{3}{4}$ lbs.

Centennial.—On light sandy loam, ploughed in autumn of 1892, on which was spread a light coating of manure, about ten tons per acre, in spring of 1893, which was turned under with gang plough and harrowed before sowing; $\frac{1}{2}$ acre. Sown May 27th, $2\frac{3}{4}$ bushels per acre, ripe August 25th, time to mature, 90 days, yield per acre, 30 bushels 15 lbs., weight per bushel, $61\frac{1}{4}$ lbs.

Golden Vine.—Sown on land adjoining Centennial, of same character and received same treatment, $\frac{1}{2}$ acre. Sown May 27th, $2\frac{1}{2}$ bushels per acre, ripe August 25th, time to mature, 90 days, weight per bushel, 62 lbs.

FALL RYE.

Variety *Reading Giant* sown on light sandy soil, previous crop was partly oats and partly wheat. Land ploughed, then harrowed three times, no manure was used. Sown Sept. 8th, 1892, $1\frac{1}{2}$ bushels per acre, ripe July 27th, 1893, yield per acre, 25 bushels 8 lbs., weight per bushel, 54 lbs.; length of head, 3 to $3\frac{1}{2}$ inches, average length of straw, 58 inches, badly lodged, no rust or smut.

EXPERIMENTS WITH TURNIPS.

Eighteen varieties were tested in 1893 in experimental plots in two sets sown eight days apart. In sowing the first set only fourteen varieties of seed were used and they were sown 1st June in rows $2\frac{1}{2}$ feet apart, the second series with eighteen

varieties was sown 9th June also $2\frac{1}{2}$ feet apart. Both were pulled on the 25th October. The yield per acre has been calculated from the quantity obtained from 2 rows, 33 feet long and $2\frac{1}{2}$ feet apart.

The land used for these experiments was a heavy sandy loam of good quality which was manured in the fall of 1891, about 18 tons being applied to the acre and an oat crop was grown on it in 1892. It was ploughed from 7 to 8 inches deep in the autumn of 1892, and gang-ploughed in the spring of 1893 and harrowed three times and rolled before sowing. The seed was sown on the flat which we find to be less economical than in ridges, the crop requiring more labour in thinning and hoeing than when sown in ridges.

The rot which has prevailed in the turnips here for the past two years and was referred to in the annual report for 1892 injured the crop again this year, but in a less degree than formerly, the injury however has been sufficient to lessen the yield very much.

EXPERIMENTS WITH TURNIPS—FIRST SERIES—SOWN JUNE 1ST.

Name of variety.	Yield per Acre.		Yield per Acre.	
	Tons.	Lbs.	Bush.	Lbs.
Marquis of Lorne	16	1,132	552	12
Prize Purple Top	13	1,456	457	36
Carter's Prize Winner	13	400	440	00
Bangholm Improved	12	156	402	36
Jumbo or Monarch (Steele)	11	1,628	393	48
Mixed, from Agassiz, B.C	10	1,648	360	48
Mammoth Purple Top	10	1,120	352	00
Carter's Elephant Swede	10	592	343	12
Bronze Purple Top	9	1,800	330	00
Sutton's Champion	8	1,424	290	24
Skirving's Purple Top	8	1,160	286	00
Selected East Lothian	8	764	279	24
Jumbo or Monarch (Vilmorin)	8	764	279	24
Clyde Improved	6	1,992	233	12

EXPERIMENTS WITH TURNIPS—SECOND SERIES—SOWN JUNE 9TH.

Name of variety.	Yield per Acre.		Yield per Acre.	
	Tons.	Lbs.	Bush.	Lbs.
Carter's Elephant Swede	14	908	481	48
Selected East Lothian	13	796	446	36
Purple Top, seed grown at Agassiz, B.C.	12	552	409	12
Clyde Improved	11	572	376	12
Bronze Purple Top	11	440	374	00
Simmer's Giant Swede	11	440	374	00
Skirving's Purple Top	11	176	369	36
Jumbo or Monarch (Vilmorin)	10	856	347	36
Marquis of Lorne	10	64	344	24
Prize Purple Top	9	1,800	330	00
Simmer's Champion Purple Top	9	744	312	24
Carter's Prize Winner	8	1,688	294	48
Elephant Swede (Agassiz)	7	1,972	266	12
Sutton's Champion	7	784	246	24
Mixed, from Agassiz	7	652	244	12
Bangholm Improved	7	124	235	24
Mammoth Purple Top	6	672	211	12
Jumbo or Monarch (Steele)	4	844	147	24

EXPERIMENTS WITH MANGELS.

Ten varieties of mangels were sown on land adjoining the turnips; the treatment and preparation of the soil will be found under that heading. The seed was sown in rows 2½ feet apart, and the plants afterwards thinned out to 8 to 12 inches apart. Two sets of these plots were sown, the first on 1st June, the second on 9th June; both were pulled 25th October. The yield per acre has been calculated from the result obtained from two rows each 33 feet long and 2½ feet apart.

EXPERIMENTS WITH MANGELS—FIRST SERIES—SOWN 1ST JUNE.

Name of variety.	Yield per Acre.		Yield per Acre.	
	Tons.	Lbs.	Bush.	Lbs.
Champion Yellow Globe	21	504	708	24
Mammoth Long Red	20	656	677	36
Giant Yellow Intermediate	19	16	633	36
Canadian Giant	17	1,904	598	24
Gate Post	17	1,640	594	00
Red Globe	17	584	576	24
Warden Orange Globe	14	1,964	499	24
Golden Tankard	13	1,720	462	00
Red Fleshed Tankard	13	1,720	462	00
Erfurt Model	12	1,872	431	12

EXPERIMENTS WITH MANGELS—SECOND SERIES—SOWN 9TH JUNE.

Name of variety.	Yield per Acre.		Yield per Acre.	
	Tons.	Lbs.	Bush.	Lbs.
Giant Yellow Intermediate	21	1,560	726	00
Red Globe	21	768	712	48
Mammoth Long Red	18	300	605	00
Champion Yellow Globe	17	452	574	12
Golden Tankard	16	1,264	554	24
Gate Post	14	512	475	12
Canadian Giant	12	816	413	36
Warden Orange Globe	12	156	402	36
Red Fleshed Tankard	10	1,912	365	12
Erfurt Model	8	764	279	24

EXPERIMENTS WITH CARROTS.

Eleven varieties of carrots were sown on land adjoining the mangels, and similar in character; the treatment and preparation of the soil was the same as that for turnips, and the particulars will be found under that heading. The seed was sown on the flat, in rows 18 inches apart. There were two sets of plots; the first sowing was on 1st June, the second on 9th June, and they were both pulled 25th and 26th October. The yield per acre has been calculated from the produce of two rows 33 feet long and 18 inches apart.

FIRST SERIES, sown 1st June.

Name of variety.	Yield per Acre.		Yield per Acre.	
	Tons.	Lbs.	Bush.	Lbs.
Mammoth White Intermediate	28	320	938	40
Giant Short White	27	1,440	924	00
Improved Short White	25	1,920	865	20
White Belgian	24	840	814	00
Large Short White Vosges	23	640	770	20
Chantenay Half Long Scarlet	22	660	744	20
Early Gem	18	300	605	00
Half Long Coreless	17	1,640	594	00
Half Long Red Danvers	16	1,880	564	40
Carter's Orange Giant	15	1,240	520	40
Long Scarlet Altringham	12	860	414	20

SECOND SERIES, SOWN 9TH JUNE.

Name of variety.	Yield per Acre.		Yield per Acre.	
	Tons.	Lbs.	Bush.	Lbs.
Mammoth White Intermediate	30	1,600	1,026	40
Improved Short White	28	1,200	953	20
Giant Short White	25	160	836	00
White Belgian	20	1,140	685	40
Large Short White Vosges	19	940	649	00
Half Long Red Danvers	19	720	645	20
Carter's Orange Giant	19	60	634	20
Chantenay Half Long Scarlet	17	1,200	586	40
Early Gem	17	540	575	40
Half Long Coreless	13	1,940	465	40
Long Scarlet Altringham	11	1,760	396	00

EXPERIMENTS WITH SUGAR-BEETS.

Four varieties of sugar-beets were sown during 1893 on land adjoining that on which the mangels were sown. The treatment of the soil and its preparation will be found under the heading of turnips. There were two series of plots: one was sown on 1st June, the second on 9th June, and both were pulled 25th October. The seed was sown on the flat, in rows 18 inches apart and the yield per acre has been calculated from the weight of roots obtained from two rows each 33 feet long and 18 inches apart.

EXPERIMENTS WITH SUGAR BEETS.—FIRST SERIES, SOWN 1ST JUNE.

Name of variety.	Yield per Acre.		Yield per Acre.	
	Tons.	Lbs.	Bush.	Lbs.
White Green Top Brabant Improved	20	700	678	20
French	17	100	568	20
Klein Wanzleben	15	360	506	00
White Improved	15	140	502	20

Experiments with Sugar Beets.—Second Series, sown 9th June.

Name of variety.	Yield per Acre.		Yield per Acre.	
	Tons.	Lbs.	Bush.	Lbs.
French	19	1,600	660	00
White Green Top Brabant Improved	18	740	612	20
Klein Wanzleben	17	1,860	597	40
White Improved	17	100	568	20

THE BEET-SUGAR INDUSTRY.

Much interest has attached for many years past to the cultivation of sugar beets, on account of the high percentage of sugar with which they can now be grown, also for the reason that so large a proportion, considerably more than one half, of the world's supply of sugar is now made from the sugar-beet. For several years past experiments have been carried on at the experimental farms and elsewhere with the best seed obtainable from many sources. The results of these tests indicate (as shown in the analyses published by the Chemist of the Farms in previous reports) that the sugar-beet grown in most parts of Canada when raised from the best seed will on the average contain as large a percentage of sugar as similar beets grown in any other part of the world.

During the latter part of 1891 the Dominion Government caused an inquiry to be made in regard to this industry and I was requested to undertake the work. On the 28th of October of that year I visited the beet-sugar factory at Farnham, Quebec, the only factory then in operation in Canada. I then proceeded to Philadelphia where I obtained from a son of Mr. Claus Spreckles information regarding the recent progress of the beet-sugar industry in California. Washington was next visited and much additional information obtained from Dr. H. W. Wiley, Chemist of the Department of Agriculture, whose general investigations into this subject have given him a world wide reputation. I also visited the beet-sugar factories in operation at Grand Island and Norfolk in Nebraska, where all the information desired was given me by the proprietors, Messrs. Oxnard Bros. On my return a report was prepared on this subject which was submitted to the Honourable Minister of Finance on the 1st of February, 1892 and subsequently distributed in the House of Commons. In this report the rise and progress of this industry in Europe, the United States and Canada were sketched ; the various systems of bounty (without which it does not appear that this industry could be sustained) were explained and statistics given as to the relative cost of production of cane and beet-sugar. In summing up the evidence presented, the following remarks were made :—"It is probable that the strongest objection to the encouragement of this industry on the only basis on which it is claimed it could be established, will be found in the fact that it would require when fully developed an annual subsidy of about $4,000,000 for the raising of which as long as we have free sugar, other industries must be taxed. This subsidy might in the course of time be lessened, but in view of all the facts presented, of the greater richness of the sugar cane when grown in the tropics and the probabilities of further improvements in the quality of the cane and in the process of manufacture it is not likely that the bounty could ever be much reduced without crippling the industry."

In the second part of this report the improvement of the sugar-beet is treated of, the most improved methods of cultivation explained and other related subjects discussed. This report was favourably received by the larger part of the press of Canada and many copies have been solicited by parties interested in this subject in the United States including Senators and Members of Congress.*

* Copies of this report may be had on application.

EXPERIMENTS WITH POTATOES.

Sixty-one varieties of potatoes have been tested side by side on sandy loam of medium quality. The land received a coating of manure of about 18 tons per acre in the autumn of 1892, which was at once ploughed under. In the spring of 1893, the land was gang-ploughed and harrowed twice.

In planting, the seed end of the potatoe was cut off and rejected and the tubers then cut into pieces with two or three strong eyes, planted one foot apart in the rows, with the rows 2½ feet apart, the seed was then covered with a hoe. The potatoes were planted from May 27th to 30th, came up June 12th to 15th, and were harvested on the 19th September.

TEST of Varieties of Potatoes.

Name of variety.	Size of Plot.	Total Yield per acre of Sound and Rotten.		Yield per acre of Sound.		Yield per acre of Marketable.		Yield per acre of Unmarketable.		Yield per acre of Rotten.	
	Feet.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.
Burnaby Seedling	66 x 2½	347	36	96	48	90	12	6	36	250	48
Geo. McKenzie, from	66 x 2½	341	00	121	00	116	36	4	24	220	00
Seattle	132 x 2½	322	18	113	18	111	06	2	12	209	00
White Beauty	132 x 2½	321	12	107	48	100	06	7	42	213	24
Crown Jewel	132 x 2½	315	42	90	12	82	30	7	42	225	30
Holborn Abundance	132 x 2½	315	42	237	36	221	06	16	30	78	06
London	132 x 2½	315	42	146	18	136	24	9	54	169	24
Sharpe's Seedling	132 x 2½	309	06	165	00	156	12	8	48	144	06
Dakota Red	132 x 2½	297	00	209	00	194	42	14	18	88	00
Lee's Favourite	132 x 2½	292	36	161	42	147	24	14	18	130	54
Daisy	132 x 2½	288	12	118	48	104	30	14	18	169	24
Pearce's Extra Early	132 x 2½	281	36	96	48	83	36	13	12	184	48
Northern Spy	132 x 2½	278	18	151	48	140	48	11	00	126	30
Clark's No. 1	132 x 2½	278	18	148	30	139	42	8	48	129	48
Early Ohio	132 x 2½	276	06	103	24	93	30	9	54	172	42
Thorburn	132 x 2½	264	00	103	24	96	48	6	36	160	36
Everett	132 x 2½	261	48	125	24	118	48	6	36	136	24
Early Thorburn	132 x 2½	261	48	125	24	118	48	6	36	136	24
do Sunrise	132 x 2½	257	24	93	30	91	18	2	12	163	54
do Puritan	132 x 2½	255	12	124	18	106	42	17	36	130	54
Harbinger	132 x 2½	253	00	112	12	103	24	8	48	140	48
I. X. L.	66 x 2½	253	00	57	12	53	54	3	18	195	48
T. K. Fullerton, from	132 x 2½	253	00	73	42	.....	.....	.....	.....	179	18
Vick's Extra Early	132 x 2½	253	00	58	18	51	42	6	36	194	42
Rural Blush	132 x 2½	251	54	206	48	174	54	31	54	45	06
State of Maine	132 x 2½	250	48	61	36	56	06	5	30	189	12
Empire State	132 x 2½	248	36	71	30	67	06	4	24	177	06
Lizzie's Pride	66 x 2½	246	24	165	00	158	24	6	36	81	24
Polaris	132 x 2½	240	54	96	48	86	54	9	54	144	06
Lee's Favourite, Mrs. Foster	132 x 2½	240	54	83	36	.....	.....	.....	.....	157	18
Hale's Champion	132 x 2½	234	18	.....	.....	.....	.....	.....	.....	.....	.....
Chicago Market	132 x 2½	232	06	89	06	82	30	6	36	143	00
Early Rose, C. E. F.	132 x 2½	226	36	107	48	100	06	7	42	118	48
Beauty of Hebron	132 x 2½	221	06	144	06	128	42	15	24	77	00
Early Rose, Brandon	132 x 2½	216	42	77	00	69	18	7	42	139	42
Green Mountain	132 x 2½	214	30	40	42	38	30	2	12	173	48
Burpee's Extra Early	132 x 2½	213	24	70	24	64	54	5	30	143	00
Vanier	132 x 2½	212	18	176	00	155	06	20	54	36	18
Irish Champion	132 x 2½	207	00	104	30	75	54	28	36	103	24
Hopeful	132 x 2½	201	00	50	36	46	12	4	24	150	42
Blue Cup	66 x 2½	195	48	83	36	77	00	6	36	112	12
Seedling No. 214	132 x 2½	178	12	82	30	78	06	4	24	95	42
do No. 115	132 x 2½	172	42	9	54	9	21	0	33	162	48
do No. 230	132 x 2½	171	36	27	30	20	54	6	36	144	06
Algoma No. 1	132 x 2½	169	24	36	18	35	45	0	33	133	06
Early Gem	132 x 2½	163	54	55	00	40	42	14	18	108	54

TEST of varieties of Potatoes—*Concluded.*

Name of variety.	Size of Plot.	Total Yield per acre of Sound and Rotten.		Yield per acre of Sound.		Yield per acre of Marketable.		Yield per acre of Unmarketable.		Yield per acre of Rotten.	
	Feet.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush,	Lbs,
Seedling No. 25	132 x 2½	161	42	84	42	67	06	17	36	77	00
Vanguard	132 x 2½	160	36	27	30	26	57	0	33	133	06
Pearce's Prize Winner.....	132 x 2½	147	24	40	42	36	18	4	24	106	42
Delaware..................	132 x 2½	143	00	15	24	14	18	1	06	127	36
Bras d'Or Seedling	132 x 2½	137	30	39	36	33	00	6	36	97	54
Manitoba Kidney White..	132 x 2½	109	27	0	33	....		....		108	54
Seedling No. 33...........	132 x 2½	102	18	7	42	6	36	1	06	94	36
do No. 54............	132 x 2½	90	12	8	48	7	42	1	06	81	24
do No. 77............	132 x 2½	80	18	8	48	6	36	2	12	71	30
Red River Valley.........	132 x 2½	72	36	....		....		....		72	36
Seedling No. 188..........	132 x 2½	56	39	3	51	3	18	0	33	52	48
Brant	66 x 2½	52	48	2	12	....		....		50	36
Seedling V................	66 x 2½	48	24	24	12	17	36	6	36	24	12
do No. 140..........	132 x 2½	30	48	2	12	1	39	0	33	28	36
do X...............	66 x 2½	22	00	6	36	4	24	2	12	15	24

THE HAY CROP.

The crop of hay at the Central Experimental Farm has been remarkably good during the past season. About 104 tons have been harvested of extra good quality, the yield running from 2 to 2½ tons per acre. This important fodder crop has also given very satisfactory returns over the larger part of the provinces of Ontario and Quebec.

In view of the very short supply of hay in Great Britain and some of the countries on the continent of Europe, and the consequent high prices prevailing, it was deemed desirable that the attention of Canadian farmers should be promptly called to the importance of making the best of the advantage which this shortage offered, and by taking extra care in the curing of their hay to have it of that quality which would command a ready sale at the highest price.

On the 30th of June, 1893, copies of the following letter were sent to the press which was generally and widely published and commented on:

HAY FOR THE ENGLISH MARKET.

To the Editor of ———.

SIR,—Hay is the most important and valuable of all Canadian crops, and this year the yield promises to be most abundant. The scarcity in Europe has led to increased demand in Canada, and if the incoming crop be of good quality and well cured it will no doubt command high prices. Hay containing a considerable proportion of clover is preferred in Great Britain, and this is more difficult to cure properly than hay composed chiefly of timothy. Permit me to draw the attention of farmers generally, through your columns, to the method of curing hay practised at the Central Experimental Farm, where under the good management of the farm foreman it has given excellent results. It is also, I find, the practice of many of the best Canadian farmers. When the first flower-heads of the clover have about half withered cut the hay in the morning, after the dew is off, and begin at 1 p.m. to shake it up with forks or tedder, and cock up early enough in the afternoon to permit of the work being completed before the dew falls in the evening. The cocks are allowed to stand undisturbed the next day, but during the following morning

the hay is spread again to finish the drying, and drawn to the barn or stack before evening. If favoured with fine weather, the hay so cured will be of excellent colour, quality and fragrance, and will command the highest price. If the weather is unfavourable or showery, keep the hay in cocks until it becomes fine again. Many farmers adopt the plan of allowing the newly cut hay to dry at once, as it falls from the mower, without putting it in cocks. Hay so cured is usually more or less bleached and does not retain the fine colour and aroma which distinguishes hay of first quality, and does not command so ready a sale or so high a price.

WM. SAUNDERS,

Director Experimental Farms.

Ottawa, June 30th, 1893.

The attention of English dealers in hay was also called to the large surplus which Canada would have to offer, and letters of inquiry from prominent firms in Great Britain and France, were published in the press, as received. The attention of the Eastern Boards of Trade was also called to this matter, and many letters written to the larger dealers in Canada giving them information. A considerable foreign demand for Canadian hay was thus created, and large shipments have been made.

SMUT IN WHEAT.

For several years past much depreciation has occurred in the value of wheat in Manitoba and the North-west Territories from the presence of bunt or stinking smut. This parasitic fungus has infested the grain in large percentage, and owing to the unpleasant odour of the spores which attach themselves to the grain during the process of threshing, much wheat which would otherwise have commanded a good price has been reduced in value and sometimes rendered unsalable.

In *Bulletin* 3 of the Experimental Farm series, published in March, 1888, prepared by Mr. James Fletcher, Entomologist and Botanist to the Experimental Farms, this subject was brought prominently before the farmers of Canada, the life history of this and another species of smut which injures cereals, described, and remedies recommended for preventing the injury they cause.

Since that time systematic experiments have been carried on at the Experimental Farms at Brandon, Man., and Indian Head, N.W.T., which have demonstrated that bluestone, or copper sulphate (a remedy long used in England for this purpose), is a most economical and reliable means of preventing this evil. The results of these experiments have been fully presented in the annual reports of the experimental farms, but in order to bring the matter more immediately and prominently under the notice of the farmers in the Canadian North-west, who are the chief sufferers from this trouble, a circular was prepared embodying in a condensed form the results of the experience gained, with directions for the use of the remedy, and 25,000 of these were printed and distributed among the western farmers a few weeks before the period of sowing. The following is a copy of the circular :—

TO THE FARMERS OF MANITOBA AND THE NORTH-WEST TERRITORIES.

SMUT IN WHEAT.

The heavy losses which have of late years fallen on many farmers in Manitoba and the North-west Territories from depreciation in the value of their wheat from the presence of smut, should be a warning to every settler to adopt the preventive measures which have been thoroughly tested and shown to be efficient on the Dominion Experimental Farms at Brandon, Man., and Indian Head, N.W.T.

The "bunt" or "stinking" smut is the result of a fungous growth which is propagated by very minute spores, visible only with a magnifying glass of high power. These spores are scattered over the wheat by the breaking of the "smut balls" during the process of threshing, and they give to the grain a characteristic and offensive odour. If smutty wheat be sown untreated these spores will vegetate

and develop minute thread-like growths, which find their way through the tissues of the young wheat plant, and multiply in the sap. Later in the season a proportion of the kernels in the head will be found to have their normal contents entirely consumed, to have become unnaturally swollen and the interior filled with a black mass of smut spores. These altered and swollen kernels are commonly known as "smut balls." Full particulars of the life history of this species of smut will be found in bulletin No. 3 of the Experimental Farm series, prepared by Mr. Jas. Fletcher, Entomologist and Botanist.

REMEDY.

Dissolve one pound of bluestone (copper sulphate) in a pailful and a half of water (about three gallons) and sprinkle the solution on ten bushels of seed wheat, previously spread in a tight wagon box, or on a clear floor space in barn or house, keeping the grain constantly stirred while the solution is being applied, and mixing the whole thoroughly so that every kernel of the wheat may be wetted. In a very few hours the seed will be in good condition to sow with the drill. A good plan is to apply the treatment in the evening and sow the grain the following morning. If the water be used warm and the lumps of bluestone be broken, the solution may be made in a few minutes. As the solution of bluestone lessens in some degree the germinating power of wheat, and more so when it remains long in contact with it, the safe plan is to treat the seed but a short time before sowing.

In the tests which have been carried on with this remedy for the past three years at the Experimental Farms at Brandon and Indian Head, the worst smutted samples procurable have been selected for sowing, and the results have shown, by comparing the crop from the treated with that from the untreated grain, that this remedy is thoroughly efficient. It is also easy of application, and its cost is trifling; usually about one cent per bushel of seed.

It has been often observed that a smutty crop will sometimes result when good clean seed has been sown. This is believed to arise from smut spores in the soil coming in contact with the grain when germinating. As millions of these spores are spread in all directions by wind during the period of threshing and carried long distances, there are doubtless large numbers of them in the soil in all the wheat growing districts of the country. Hence it is much safer to treat all seed before sowing, whether it is perceptibly smutty or not, as the coating of bluestone on the treated grain will protect the seed from attack by spores in the soil.

Having thoroughly satisfied ourselves of the efficacy and reliability of this remedy, and of the importance of its general use, we would strongly recommend that all seed during the coming season be treated in accordance with the directions here given, believing that every settler who acts on this advice will realize an increased crop, which will bring a higher price, and he will also assist in raising the standard of quality of the wheat grown in Manitoba and the North-west Territories to one of uniform excellence.

WM. SAUNDERS,
Director Experimental Farms, Ottawa.

S. A. BEDFORD,
Supt. Experimental Farm, Brandon, Man.

ANGUS MACKAY,
Supt. Experimental Farm, Indian Head, N.W.T.

The Winnipeg Board of Trade also issued a circular on this subject, and the press generally commented on the necessity of farmers everywhere using this remedy, so that this evil might be lessened, and if possible, stamped out. The results have been most gratifying; many tons of bluestone were bought and used in the manner directed, and the crop of this year is said to be almost entirely free from smut. As a precautionary measure this method of treating the wheat should be continued for several years.

WORLD'S COLUMBIAN EXPOSITION.

On the 11th of January, 1892, I was appointed by Order in Council, Executive Commissioner for Canada in connection with the World's Columbian Exposition, a position which was held until the 21st of November in that year. Over ten months of incessant and heavy labour in the endeavour to discharge this duty, in addition to the work devolving on me as Director of the Experimental Farms, brought about a condition of ill-health and exhaustion which made my resignation a necessity. In the meantime, however, all the preliminary work had been completed. After a number of visits to Chicago, sufficient space was secured in excellent locations in all the buildings, a most important measure towards success, and as a result of much effort, an admirable site was obtained for a Canadian building, to serve as an office building for the Commissioners and a meeting place for visiting Canadians.

The grand dairy exhibit was arranged and provided for. The Governments of all the provinces were interviewed and negotiations conducted, the departments of work which each were to undertake agreed on, and the hearty co-operation of nearly all the provinces secured. With the able assistance of Mr. J. S. Larke (who was subsequently appointed my successor), Mr. Lucien Huot of Montreal, Mr. W. D. Dimmock of Truro, N.S., and Mr. E. A. Charters, of Sussex, N.B., the greater part of the exhibits had been secured, the particulars of which are given in my report of the progress of the work published a few weeks after my resignation.* The way was thus prepared for the brilliant success which has crowned the efforts of our people.

To make the agricultural exhibits from the Experimental Farms as complete as possible, special sowings were made in the spring of 1892, of a very large number of different sorts of grain and seeds, and a lively interest awakened in this undertaking among all the officers connected with these institutions. In this way the finest collection of Canadian agricultural products ever seen was made available, and subsequently clothed the grand trophy which attracted so much attention in the Agricultural court.

Before the time arrived for beginning the work of placing the exhibits, my health was so far restored as to enable me to render further aid in the carrying out of this great undertaking, and at the special request of the Minister of Agriculture, and of my successor in the office of Executive Commissioner, I consented to undertake the designing and arranging of all the exterior decorations of the agricultural court, also the construction of the great central trophy, and to render what help I could by assisting in the arrangement of the products in portions of the interior of the court.

After consultation with Mr. D. Ewart, of the Chief Architect's office, Department of Public Works, he prepared a plan of the woodwork on which the decorations were to be placed which served the purpose admirably, he also supervised its construction. As soon as the preparations for the work were sufficiently advanced, I secured the able assistance of Mr. W. H. Hay, the accountant at the Central Experimental Farm, and Mr. J. Fixter, the Farm foreman, both of whom brought to bear on this undertaking much practical experience, gained at previous provincial and other exhibitions. We were also assisted by Mr. S. A. Bedford, Superintendent of the Experimental Farm at Brandon, and Mr. A. Mackay, the Superintendent of the Experimental Farm at Indian Head. With these competent assistants the work made rapid progress, and in two or three weeks it was so well advanced that all returned to their other duties, excepting Mr. Hay, who remained to complete the work which had been planned, which he did with good judgment and taste and much credit to himself.

The exterior decorations of the court were very much admired, the interior work was equally good, and the Canadian exhibit as a whole was generally conceded to be the finest agricultural display in the building. It was arranged in provincial groups, in which all the provinces, excepting Manitoba and New Brunswick

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* Copies of this Report may still be had on application.

were represented. The exhibit of Ontario (which included an excellent selection of samples from the Agricultural College at Guelph), was especially fine; Quebec came next in importance, followed by the North-west Territories, British Columbia, Nova Scotia and Prince Edward Island, all the displays being excellent both in the quality and variety of the articles shown.

The large central trophy was covered entirely with the products of the several Experimental Farms, from which sources were also obtained the materials for the exterior decoration of the court. Since Manitoba was not represented as a province, the front of the trophy was covered with the products of the Branch Farm for Manitoba; the samples from the Central Farm were placed on the side contiguous to the exhibits of Ontario and Quebec, the other sides of the exterior and interior of the trophy being devoted to a display of the productions of the branch farms for the North-west Territories, British Columbia and the Maritime Provinces. The samples of grain and agricultural seeds were relieved by the introduction of a very complete collection of native and cultivated grasses arranged by Mr. James Fletcher, Botanist and Entomologist of the Farms, also by a large number of photographs of different portions of the Experimental Farms, including harvest scenes, cattle, &c., the whole making a grand display, illustrating the manifold character of the work in progress in connection with the Dominion system of Experimental Farms.

Adjacent to the trophy, there was displayed in a prominent position, a collection of Canadian insects, prepared and arranged by Mr. James Fletcher, who devoted much labour to this work. In addition to many beautiful examples of insects of brilliant colour and attractive form, this collection included many species which injure agricultural and horticultural products.

The dairy exhibits which brought into such prominence the high quality of Canadian cheese and butter, were to a large extent the result of the untiring efforts of the Dairy Commissioner, Mr. J. W. Robertson, who, assisted by competent experts from the Dairy Associations and members of his own staff, and aided by practical dairymen all over the Dominion, achieved a success for Canada of which the people everywhere have reason to feel proud.

During my stay in Chicago, I was also able to render assistance to the Dominion Superintendent in charge of the Canadian horticultural products, Mr. L. Woolverton, in planning the arrangements for the display of fruits and vegetables, to which the Experimental Farms were large contributors. Mr. John Craig, horticulturist at the Central Farm, devoted himself assiduously to the collecting and preparing of fruits for this purpose during the summer of 1892, and there was put up in preserving fluids under his supervision an excellent collection representing the progress which has been made in that division of the work which he superintends. The collection embraced an extensive and varied assortment of small fruits, also a number of varieties of cherries, plums and some apples, all grown at the Central Experimental Farm. Subsequently during the period of the exhibition Mr. Craig rendered further assistance by sending forward supplies of fresh vegetables and fruits, among the latter a display of grapes, consisting of 122 different varieties, all ripened in the open air at Ottawa. These attracted much attention, and excited the surprise of visiting fruit growers who reside further south, who did not anticipate that so many sorts of grapes could be ripened so well in the open air so far north as Ottawa.

The branch Experimental Farms also did excellent service, and in addition to their large contributions to the grain exhibits they provided material for the horticultural display. Mr. Wm. M. Blair, the Superintendent of the Experimental Farm for the Maritime Provinces, forwarded from Nappan, Nova Scotia, a large quantity of very excellent roots and other vegetables, partly the growth of the Experimental Farm, and partly contributed by the farmers of Nova Scotia and New Brunswick. Mr. Blair also sent samples of the small fruits grown on the Nappan Experimental Farm. Mr. S. A. Bedford contributed from the Brandon, Manitoba Experimental Farm, a quantity of preserved vegetables, also a number of varieties of small fruits both cultivated and wild. An excellent assortment of a similar character was sent by Mr. A. Mackay from the Experimental Farm at Indian Head, N. W. T., and both these western farms sent frequent contributions of fresh vegetables during the summer season. Mr. Thos. A. Sharpe, Superintendent of the Experimental Farm at

Agassiz, British Columbia, provided a fine assortment of preserved fruits, all grown at the Experimental Farm, and these were followed by consignments of fresh fruit from time to time including gigantic plums, fine cherries, apples and other products.

The following list of awards affords further evidence of the high quality of the products supplied by the Experimental Farms. In Agriculture further awards are expected.

Agriculture. Central Experimental Farm, Ottawa, cereals and grasses. Experimental Farm, Indian Head, cereals and grasses.

Horticulture. Central Experimental Farm, Ottawa, collection of vegetables and collection of grapes, crop of 1893. Experimental Farm, Nappan, N. S., collection of vegetables; Experimental Farm, Brandon Man., vegetables preserved in solutions and collection of fresh vegetables, Experimental Farm, Indian Head, N. W. T., collection of vegetables. Experimental Farm, Agassiz, British Columbia, apples, crop of 1893.

The intimate knowledge of insects and their habits possessed by Mr. James Fletcher, Entomologist and Botanist of the Experimental Farms, enabled him while in Chicago, during the month of October, to render timely aid to the Executive Commissioner by examining and reporting on some injurious insects found feeding on the various grains and seeds exhibited, and which at that time were the cause of some anxiety. Mr. Fletcher was able to show that these invaders were old enemies which Canada had no reason to fear and thus the alarm which had been felt under the impression that they were new foes to agriculture was speedily allayed.

An opportunity was also afforded Mr. F. T. Shutt, Chemist to the Experimental Farms, who has had much experience in the analysis of cereals to use the information he has acquired in this branch of his work to the advantage of the Dominion. He was chosen on this occasion as an expert juror in the Agricultural department and devoted many weeks to the analysis of the finer samples of cereals shown, not only in the Canadian exhibits, but also in all parts of the Agricultural building. The results of these analyses have assisted in demonstrating the high quality of Canadian cereals aud especially of the wheat grown in the Canadian North-west.

Early in the history of the exposition, elaborate plans were laid to secure the presence and services of competent men in every department of knowledge from all parts of the world to deliver addresses before conventions specially called in the interest of various branches of science, art, industry, education, etc. In the early part of the year a series of addresses was delivered under the auspices of the exposition authorities, having special reference to the timber productions of the several countries which exhibited in the building devoted to Forestry. An invitation was sent me by the chief of that department to deliver one of these addresses on 20th June, when I presented a paper on the subject of tree growth and forest distribution in Canada, in which I called attention to the timber resources of the several provinces and territories in the Dominion. Later in the season, I was invited to deliver addresses at several of the special conventions or congresses. Owing to absence on the Pacific coast, I was unable to respond to the invitation to be present at the congress of horticulture, but I returned in time to address the congresses relating to agriculture, to agricultural colleges and experiment stations and to forestry. On the occasion of these gatherings I was enabled to disseminate much information regarding the agricultural and other natural resources of Canada. At the agricultural congress, I addressed the assembly on the agricultural resources of the Dominion, when reference was made to the high character and quality of Canadian agricultural products as demonstrated by the exhibits which Canada had made. Statistics of the United States and Canada were quoted, showing that the average crops realized by the Canadian farmer were higher than those obtained by farmers in the United States, and special reference was made to the large area of fertile country in the North-west available for settlement, with which my frequent visits had made me personally familiar.

At the congress of agricultural colleges and experiment stations I had the pleasure of meeting representatives from Russia, Germany and Japan, as well as a large number from the United States, and addressed the assembly on the good work being accomplished in the several provinces of Canada by agricultural colleges, dairy schools, farmers' institutes and agricultural circles, and gave some particulars re-

garding the methods by which the Government of Canada was endeavouring to benefit the Canadian farmer through the agency of the experimental farms.

At the Forestry Congress the topic assigned for my address was "Forest Conditions of the Plains and Prairies of Canada." In introducing the subject reference was made to the vast timber resources of the older provinces and to the measures which have been taken to preserve the forests from fire and to make the best use of this great source of national wealth. The great plains from Winnipeg to the Rocky Mountains were described, the distribution of forest growth in the various sections referred to and the efforts made during the past few years through the experimental farms to improve these conditions. Attention was also called to the vast country lying north of present settlement and to the information thus far gained as to the forest resources of that great area.

THE COMING ANTWERP EXHIBITION.

A short time prior to the close of the World's Columbian Exposition it was decided by the Dominion Government that Canada should take part in the Antwerp Exhibition, and I was requested to assist in selecting from the exhibits in Chicago such examples of agricultural products and of fruits as would be suitable for the purpose and best serve to show the character of the Canadian climate and the productiveness of the soil, also such products of the forests as could be secured. In company with the Deputy Minister of Agriculture, Mr. John Lowe, I visited the several Canadian courts and assisted in securing much useful material. On my return to Ottawa I was requested to continue to render all the assistance in my power to the furtherance of this enterprise and sent my assistant, Mr. W. T. Macoun to Chicago who made a careful selection of the best of the agricultural products shown there. A collection of about 1,500 bunches and sheaves of grain in the straw and 720 of the finest samples of cleaned grain were selected by Mr. Macoun who has had much experience in such work. There were also secured from the Manitoba Exhibits for this purpose about 120 bunches of grain in the straw and 80 samples of cleaned grain. These cereals were packed in suitable cases and are now in Ottawa awaiting shipment to Antwerp.

Under the supervision of the Dominion Superintendent of Horticulture, Mr. L. Woolverton, a large number of samples of fruit, including contributions from all the provinces exhibiting, were carefully packed and forwarded. These arrived in Ottawa in fairly good condition and are now being examined, the best specimens are being selected, the bottles filled with fresh fluids such as will withstand frost, and the collection will be repacked in time to be forwarded with the other exhibits from Canada.

ORNAMENTAL TREES AND SHRUBS.

The ornamental planting on the Central Experimental Farm extending from the main entrance gate to the barn and around the buildings and dwellings consists of thirty-five clumps, some of them closely planted, others open and scattered to suit the several situations. These clumps contain at present 1,789 trees and shrubs, comprising a most instructive, interesting and valuable collection. In their arrangement the individual specimens have been selected and grouped with the view of producing the best effects by combinations of spring and autumnal colours, by placing those together which harmonize in form and habit, or which make pleasing contrasts in these particulars. Due regard has been had to the intermingling of a sufficient number of evergreens with the deciduous trees to lend a charm to the grounds during those periods in the year when the deciduous trees are leafless. Proper attention has also been given to the judicious placing of the several groups in accordance with the principles practised by the best landscape gardeners. There are in these groups 225 named species and varieties and a few other varieties as yet undetermined. The following are all represented, some by one or two specimens only, of others the number is much larger; those marked hardy have stood the climate

of Ottawa uninjured, those marked half hardy have commonly had their wood partly killed, while those marked tender are usually killed back to the snow line. Some of these trees and shrubs have been planted for 5 or 6 years, while others have only been under test for two or three seasons. Nearly all have made satisfactory growth, and these plantations are already attracting much attention from visitors.

List of ornamental trees and shrubs in groups and clumps on the Central Experimental Farm.

Abies balsamea.—Balsam fir; hardy.
do concolor.—One-coloured fir; hardy.
do Fraseri.—Fraser's fir; hardy.
do pectinata.—Comb-like fir; tender.
Acer dasycarpum.—Silver-leaved maple; hardy.
do do Wierii.—Wier's cut-leaved maple; hardy.
do Ginnala.—Ginnalian maple; hardy.
do glabrum.—Smooth maple; hardy.
do Pennsylvanicum.—Pennsylvanian or striped maple; hardy.
do platanoides.—Plane-like or Norway maple; hardy.
do do Schwedleri.—Schwedler's maple; half hardy.
do pseudoplatanus.—Sycamore maple; half hardy.
do do albo-marginata.—Variegated sycamore maple; tender.
do rubrum.—Red maple; hardy.
do saccharinum.—Sugar maple; hardy.
Æsculus hippocastanum.—Common horse-chestnut; hardy.
Alnus glutinosa.—Sticky alder; hardy.
do do laciniata.—Imperial cut-leaved alder; hardy.
Amelanchier Canadensis.—June berry; hardy.
do do nana.—Dwarf june berry; hardy.
do vulgaris.—Common June berry; hardy.
Amorpha fruticosa.—False indigo; hardy.
Ampelopsis quinquefolia.—Virginian creeper; hardy.
do tricuspidata (Veitchii).—Three-pointed ampelopsis or Boston ivy; tender.
Amygdalus nana.—Double flowering almond; half hardy.
Artemisia Abrotanum.—Southernwood; hardy.
Berberis Thunbergii.—Thunberg's barberry; hardy.
do vulgaris.—Common barberry; hardy.
do do purpurea.—Purple barberry; hardy.
do Aquifolium.—American holly; half hardy.
Betula alba.—European white birch; hardy.
do do fastigiata.—Pyramidal birch; hardy.
do do laciniata.—Cut-leaved birch; hardy.
do do pendula Youngii.—Young's weeping birch; hardy.
do lutea.—Yellow birch; hardy.
do occidentalis.—Western birch; hardy.
Caragana arborescens.—Siberian pea-tree; hardy.
do do pendula.—Weeping caragana; hardy.
Carya alba.—Shell bark hickory; hardy.
Catalpa Kæmpferi.—Japan catalpa; half hardy.
do speciosa.—Hardy western catalpa; half hardy.
do do variegata.—Variegated western catalpa; tender.
Castanea vulgaris Americana.—American chestnut; half hardy.
Ceanothus Americanus.—New Jersey tea; hardy.
Celtis australis.—European nettle-tree; hardy.
do occidentalis.—American nettle-tree; hardy.
Cephalanthus occidentalis.—Buttonwood; hardy.
Cerasus Padus.—Bird cherry; hardy.

Cerasus serotina.—Wild black cherry; hardy.
Cercidiphyllum Japonicum.—Katsura-tree; hardy.
Chionanthus virginicus.—Fringe-tree; tender.
Cladrastis tinctoria.—Yellow wood; hardy.
Clematis recta.—Erect clematis; hardy.
do Virginiana.—Virginian clematis; hardy.
Cornus mas.—European dogwood; hardy.
do do elegantissima.—Elegant dogwood; hardy.
do do variegata.—Variegated dogwood; hardy.
do sanguinea.—Blood-coloured dogwood; hardy.
Cotoneaster vulgaris.—Common cotoneaster; hardy.
Corylus Avellana.—Filbert; half hardy.
do do laciniata.—Cut-leaved filbert; half hardy.
Cratægus oxyacantha.—English hawthorn; tender.
do do fl. pl.—Double flowering English hawthorn; tender.
Deutzia crenata.—Crenate deutzia; tender.
do do fl. pl.—Double crenate deutzia; tender.
do gracilis.—Slender deutzia; half hardy.
Diervilla (Weigelia) grandiflora alba.—Large flowered white weigelia; half hardy.
do do do variegata.—Variegated weigelia; half hardy.
do do lonerii.—Dark red weigelia; half hardy.
do do rosea.—Rosy weigelia; half hardy.
do do do alba.—White weigelia; half hardy.
Dimorphanthus Mandschuricus.—Manchurian dimorphantus; half hardy.
Elæagnus argentea.—Silvery eleagnus; hardy.
do hortensis angustifolia.—Narrow-leaved eleagnus; half hardy.
do augustifolia Russian olive; hardy.
Exochorda grandiflora.—Large flowered exochorda; tender.
Fagus ferruginea.—American beech; hardy.
do sylvaticus purpurea.—Purple beech; half hardy.
Forsythia suspensa.—Drooping forsythia; half hardy.
do viridissima.—Green forsythia; half hardy.
Fraxinus ornus.—Manna ash: hardy.
do viridis.—Green ash; hardy.
Gleditschia triacanthos.—Honey locust; half hardy.
Gymnocladus Canadensis.—Kentucky coffee-tree; hardy.
Hippophae rhamnoides.—Sea buckthorn; hardy.
Hydrangea paniculata grandiflora.—Large flowered hydrangea; hardy.
Juniperus communis.—Common juniper; hardy.
do do Canadensis.—Canadian juniper; hardy.
do do fastigiata.—Swedish juniper; hardy.
do Sabina.—Common savin; hardy.
do Virginiana.—Red cedar; half hardy; sometimes hardy.
Juglans cinerea.—Butternut; hardy.
do nigra.—Black walnut; hardy.
do Sieboldiana.—Japan walnut; hardy.
Larix Americana.—American larch; hardy.
do Europæa.—European larch: hardy.
Ligustrum vulgare variegatum.—Variegated privet; tender.
Lindera Benzoin.—Spice bush; half hardy.
Lonicera flava.—Yellow honeysuckle; hardy.
do Periclymenum.—English honeysuckle; half hardy.
do sempervirens.—Scarlet trumpet honeysuckle; half hardy.
do Tatarica.—White-flowered bush honeysuckle; hardy.
do do Red do do do
Magnolia acuminata.—Cucumber tree; half hardy.
Negundo aceroides.—Box elder; hardy.
Pæonia moutan.—Moutan or tree peony; hardy.
Pavia flava.—Sweet buckeye; hardy.

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Phellodendron Amurense.—Chinese cork-tree; half hardy.
Philadelphus coronarius.—Mock orange or syringa; hardy.
do cordifolia.—Heart-leaved syringa; hardy.
do deutziflora.—Deutzia flowered syringa; hardy.
do Gordonianus.—Gordon's syringa; hardy.
do grandiflora.—Large flowered syringa; hardy.
do nana.—Dwarf syringa; hardy.
Picea alba.—White spruce; hardy.
do Alcoquiana.—Alcock's spruce; hardy.
do excelsa.—Norway spruce; hardy.
do do pygmæa.—Dwarf Norway spruce; half hardy.
do Engelmanni.—Engelmann's spruce; hardy.
do nigra.—Black spruce; hardy.
do pungens.—Rocky Mountain blue spruce; hardy.
Pinus Austriaca.—Austrian pine; hardy.
do Cembra.—Swiss stone pine; hardy.
do contorta Murrayana.—Murray's pine; hardy.
do Mughus.—Mountain pine; hardy.
do do nana.—Dwarf mountain pine; hardy.
do ponderosa.—Heavy wooded or bull pine; hardy.
do Strobus.—White or Weymouth pine; hardy.
do resinosa.—Red pine; hardy.
do sylvestris.—Scotch pine; hardy.
do do Rigaensis.—Riga pine; hardy.
Platanus occidentalis.—Buttonwood; hardy.
Populus alba Bolleana.—Bolle's poplar; hardy.
do certinensis.—Asiatic poplar; hardy.
do grandidentata pendula.—Large-toothed weeping poplar; hardy.
do nigra pyramidalis.—Lombardy poplar; hardy.
do Nolesti.—Riga poplar; hardy.
Pseudotsuga Douglasii.—Douglas spruce; half hardy.
Ptelea trifoliata.—Hop-tree or wafer ash; hardy.
Prunus Pissardii.—Purple plum; half hardy.
Pyrus Americana.—American mountain ash; hardy.
do Aucuparia.—European mountain ash; hardy.
do do quercifolia.—Oak-leaved mountain ash; hardy.
do do furcata.—Hardy.
do Aria.—White beam-tree; hardy.
do baccata auruntiaca.—Siberian pyrus; hardy.
Quercus Robur.—English oak; hardy.
do rubra.—Red oak; hardy.
Retinospora ericoides.—Heath-like retinospora; half hardy.
do filifera.—Thread-like retinospora; hardy.
do obtusa.—Obtuse-leaved retinospora; half hardy.
do plumosa.—Plumose retinospora; half hardy.
do do aurea.—Golden plumose retinospora; half hardy.
do do argentea.—Silver plumose retinospora; half hardy.
do squarrosa.—Squarrose-leaved retinospora; tender.
Rhamnus catharticus.—Cathartic buckthorn; hardy.
do frangula.—Breaking buckthorn; hardy.
Rhodotypus kerrioides.—White kerria; hardy.
Rhus aromatica.—Fragrant sumach; hardy.
do cotinus.—Venetian sumach or mist shrub; hardy.
do glabra laciniata.—Fern-leaved sumach; hardy.
Ribes alpinum.—Mountain currant; hardy.
do sanguineum.—Red flowering currant; tender.
Robinia pseudacacia.—Common locust; hardy.
Rosa rubiginosa.—Sweet briar; hardy.
do rubrifolia.—Red-leaved rose; hardy.

Rosa rugosa.—Japan rose; hardy.
Rubus Nutkanus.—White flowered scented raspberry; hardy.
Salisburia adiantifolia.—Maidenhair-tree; hardy.
Salix Babylonica annularis.—Ringed willow; tender.
do capræa pendula.—Kilmarnock weeping willow; hardy.
do laurifolia.—Laurel-leaved willow; hardy.
do purpurea pendula.—American weeping willow; half hardy.
do rosmarinifolia.—Rosemary-leaved willow; hardy.
Sambucus nigra argentea.—Silver-leaved elder; half hardy.
do do aurea.—Golden-leaved elder; hardy.
do do laciniata.—Cut-leaved elder; half hardy.
Sassafras officinale.—Sassafras-tree; hardy.
Shepherdia argentea.—Buffalo berry; hardy.
Spiræa Californica.—Calfornian spirea; hardy.
do Japonica alba (callosa alba).—White Japan spirea; hardy.
do do rubra (callosa rubra).—Red Japan spirea; hardy.
do do Fortunei.—Fortune's spirea; hardy.
do media rotundifolia.—Round-leaved spirea; hardy.
do opulifolia.—Guelder-rose leaved spirea; hardy.
do do aurea.—Golden-leaved spirea; hardy.
do prunifolia.—Plum-leaved spirea double; tender.
do salicifolia.—Willow-leaved spirea; hardy.
do Van Houttei.—Van Houtte's spirea; hardy.
Symphoricarpus racemosus.—Snow berry; hardy.
Syringa Chinensis rothamagensis.—Chinese lilac; half hardy.
do Japonica.—Japan lilac; hardy.
do Josikæa.—Josika's lilac; hardy.
do vulgaris alba.—White lilac; hardy.
do do Chas. X.—Charles X. lilac; hardy.
do do purpurea.—Purple lilac; hardy.
Tamarix Amurensis.—Russian tamarisk; hardy.
Thuya Lobbii atrovirens.—Dark green arbor-vitæ; half hardy.
do occidentalis.—Common arbor-vitæ; hardy.
do do argentea.—Silver-tipped arbor-vitæ; hardy.
do do aurea.—Golden arbor-vitæ; hardy.
do do Douglas No. 2.—Douglas' No. 2 arbor-vitæ; hardy.
do do Elwangeriana.—Elwanger's arbor-vitæ; hardy.
do do globosa.—Globose arbor-vitæ; hardy.
do do pyramidalis.—Pyramidal arbor-vitæ; hardy.
do do Hoveyi.—Hovey's arbor-vitæ; hardy.
do do Tom Thumb.—Tom Thumb arbor-vitæ; hardy.
do do vervæneana.—Vervaene's arbor-vitæ; half hardy.
do Sibirica.—Siberian arbor-vitæ; hardy.
do Tatarica (Wareana).—Tartarian arbor-vitæ; hardy.
Thuyopsis borealis.—Northern thuyopsis; half hardy.
Tilia argentea.—Silver-leaved linden; tender.
do cordata.—Small-leaved linden; hardy.
do heterophylla.—American basswood; hardy.
do platyphyllos.—Broad-leaved linden; hardy.
do vulgaris.—European linden; hardy.
Tsuga Canadensis.—Hemlock spruce; hardy.
Ulmus Americana.—White elm; hardy.
do campestris.—English elm; half hardy.
do fulva pendula.—Weeping slippery elm; hardy.
do montana fastigiata.—Pyramidal Scotch elm; hardy.
do racemosa.—Rock elm; hardy.
Viburnum Lantana.—Pliant viburnum; hardy.
do opulus.—High bush cranberry; hardy.
do pauciflorum.—few flowered viburnum; hardy.

This list contains but a small proportion of the ornamental trees and shrubs under test at the Central Farm. The larger number are arranged in botanical groups in the arboretum, where under the charge of the Botanist of the Experimental Farms, Mr. James Fletcher, over 600 species and varieties have been accumulated. As soon as sufficient information has been gained as to the hardiness of these in the Ottawa climate it is proposed to publish a full list of the entire collection.

PLANTATIONS OF FOREST TREES.

There were several objects in view in planting the belts of forest trees which line the west and north sides of the farm. One was to test by actual experiment with a number of different species the comparative results in growth and development to be had by planting at different distances apart. Five feet by five, five feet by ten and ten feet by ten were the distances chosen for these tests. Another question on which information was desired was the relative growth to which trees would attain when planted in blocks of single species as compared with those planted in mixed clumps where they are associated with a number of other sorts. Further information was sought as to how far the crops on the farm located near these tree belts will be influenced by the shelter they would afford as growth progressed. In the planting, the grouping was also designed with the object of producing pleasing effects on the landscape by the intermingling and blending of varieties. The main purpose however was to get all the useful data possible with regard to the more important timber trees of economic value so that object lessons in tree growth might be available to any who in future might desire to study this subject or to engage in the enterprise of timber growing.

The work of planting was begun in 1888 and a space laid out on the west boundary 165 feet wide extending the whole width of the farm. This gave room for a line of basswood or linden trees five feet inside the boundary fence and 40 feet apart. Fifteen feet were left for a roadway east of which there were ten rows of trees five feet apart each way followed by another ten rows ten feet apart each way. This area was planned to be filled with blocks of trees of various forms, each group to consist of a single species. Along the north boundary a space was provided 65 feet in width which was to be filled as follows. A row of mixed forest trees 40 feet apart placed five feet inside the boundary fence succeeded by ten rows of mixed trees of 10 to 15 varieties, some of which were to be planted five feet by ten and others five feet by five.

The first planting in 1888 was done under the supervision of Mr. W. W. Hilborn, at that time horticulturist of the Central farm, 1,321 trees were set out that year in the mixed belt and several blocks or clumps of single species in the wider belt, numbering about 1,500 trees in all. The accompanying plate is from a photograph recently taken of a part of the trees then planted, a portion of the 5 x 5 planting is seen to the left and part of the 10 x 10 to the right. In the spring of 1889 the work of planting in blocks of single species was resumed under the charge of Mr. Thos. A. Sharpe, now superintendent of the branch experimental farm at Agassiz, B.C., and about 1,350 were added to the number. In the autumn of the same year with the assistance of the farm foreman, Mr. John Fixter, about 4,000 more were planted in blocks of single species and 560 trees added to the belt of mixed sorts. In 1890-91 and 92 the planting was continued under the supervision of Mr. John Craig, horticulturist of the Central farm and during this period the plantation was much enlarged and the wide belt on the west side completed. Mr. Craig also took charge during these years of the necessary weeding and cultivating. During the past season this work has been continued by Mr. W. T. Macoun, foreman of forestry, and under his care the tree belt on the north boundary has been much extended, and it is hoped that in another year this will be completed. In the following report submitted by by Mr. Macoun, much useful information will be found.

REPORT OF THE FOREMAN OF FORESTRY.

Owing to the very wet season, the work of this department was greatly increased this year, and it was only by much labour with the horse cultivator and hand-hoe, that the weeds could be kept in check. Not only was frequent cultivation necessary for this reason, but the soil became compact again so soon, on account of very frequent rain, that it was extremely difficult to keep it in that porous condition which is essential to best results in tree growth.

Most of the trees and shrubs bordering the avenues in the forest plantations, and on the ornamental grounds, have made rapid growth this year and are fast becoming prominent features of the farm.

Insect enemies have been very numerous, and great vigilance was required to keep them in check. By occasional spraying with a mixture of Paris green and water and much picking off by hand, they were prevented from doing any great injury. A blight on the elms caused the limbs on a considerable number of them to die, and in some cases the whole tree was destroyed by it.

Nearly nineteen acres are now planted with the trees which form the forest belts along the northern and western boundaries of the farm. The belt on the western boundary is completed and contains 9,686 trees now living. The belt along the northern boundary, which is not yet completed, contains 5,840 trees living. Thus there is now a total of 15,526 trees living in both plantations.

FOREST BELT ALONG WESTERN BOUNDARY.

In this belt the trees are grouped in clumps of one species each and for comparison are planted 5 feet apart and 10 feet apart each way to show results of planting at different distances. Where trees have been planted for several years the benefit of close planting is easily discernible, the trees making better growth with a less proportion of broken tops and limbs, and the weeds being prevented from growing by the dense shade long before weeds cease to thrive among the trees planted 10 feet apart.

As large additions have been made to this belt since 1889, when the last list was published, a complete record is now given in the following table. Several clumps composed of species which have not succeeded well have been partly or wholly replaced by others :—

Deciduous Trees.	When planted.	Total number planted.	Number living.	Number dead.
Acer saccharinum—Sugar maple	1889	240	234	6
do do do	1890	60	60	....
do platanoides—Norway maple	1889	110	110	....
do dasycarpum—Silver leaved maple	1889	120	120	....
do rubrum—Red maple	1889	170	170	....
Alnus glutinosa— Sticky alder	1889	90	90	....
Æsculus hippocastanum—Horse-chestnut	1889	90	86	4
Betula alba—European white birch	1889	90	90	....
do lutea—Yellow birch	1889	150	148	2
do papyracea—Canoe birch	1889	120	118	2
Carya alba—Shell-bark hickory	1888	8	8	....
Catalpa speciosa—Hardy Western catalpa	1889	158	154	4
do Kæmpferi—Japan catalpa	1889	30	30	....
do hybrida—Tea's catalpa	1889	30	30	....
Carpinus betulus—European hornbeam	1890	148	146	2
Cerasus serotina—Wild black cherry	8891	231	224	7
Fraxinus Americana—White ash	1889	476	473	3
do do do	1890	120	120	....
do excelsior—European ash	1889	40	40	....
do pubescens—Red ash	1889	120	120	....
do viridis—Green ash	1889	120	120	....
do sambucifolia—Black ash	1889	120	120	....

Deciduous Trees.	When planted.	Total number planted.	Number living.	Number dead.
Fagus ferruginea—American beech	1889	42	39	3
Gymnocladus Canadensis—Kentucky coffee-tree	1890	120	112	8
Gleditschia triacanthos—Honey locust	1890	92	86	6
Larix Europea—European larch	1888	275	265	10
do do	1890	30	20	10
Juglans nigra—Black walnut	1888	630	624	6
do do	1889	193	193	....
Juglans cinerea—Butternut	1888	290	288	2
do do	1889	240	237	3
Morus hybrida—Russian mulberry	1889	90	90	....
Negundo aceroides—Box elder	1889	261	261	....
Pyrus Americana—American mountain ash	1889	50	50	....
do Aucuparia—European mountain ash	1889	110	106	4
Platanus occidentalis—Button-wood	1889	120	119	1
do —(Nebraska seed) Button-wood	1890	150	134	16
Populus alba Bolleana—Bolle's poplar	1890	150	150	....
do Nolesti—Riga poplar	1892	92	92	....
do Petrovsky Petrovsk poplar	1890	50	49	1
do certinensis—Asiatic poplar	1890	40	40	......
Quercus alba—White oak	1889	41	41	....
do macrocarpa—Burr oak	1893	96	89	7
do rubra, Red oak	1888	21	19	2
do do do	1890	40	36	4
do Robur—English oak	1890	50	50	....
Robinia pseudacacia—Common locust	1889	213	209	4
Salix laurifolia—Laurel-leaved willow	1890	140	138	2
do acutifolia—Sharp-leaved willow	1890	148	146	2
do Voronesh—Voronesh willow	1890	60	60	....
Tilia vulgaris—European linden	1890	125	122	3
Ulmus Americana—White elm	1889	197	197	....
do do —(Manitoba seed) White elm	1889	38	38	....
do do do do	1890	94	94	....
do fulva—Red elm	1889	120	120	......
do racemosa—Rock elm	1889	220	213	7
do montana—Scotch or Wych elm	1890	97	92	5
do species undetermined, a small-leaved sort	1890	48	41	7
Evergreens.				
Tsuga Canadensis—Hemlock spruce	1889	30	13	17
do do	1890	62	61	1
Abies balsamea—Balsam fir	1890	63	63	....
Picea alba—White spruce	1889	180	180	....
do excelsa—Norway spruce	1889	301	301	....
do do do	1893	45	39	6
Pinus Sylvestris—Scotch pine	1888	424	423	1
do do Rigaensis—Riga pine	1889	30	30	....
do do do do	1893	108	102	6
do Austriaca—Austrian pine	1889	214	214	....
do strobus—White pine	1889	301	301	....
do do do	1890	250	247	3
Thuya occidentalis—Arbor-vitæ	1889	198	198	....

TREE PLANTING, 1893.

The spring of 1893, though unfavourable for most field work, was particularly suitable for the planting of trees. Copious rain fell during nearly the whole of May, giving the trees, when planted, good conditions for establishing themselves.

FILLING VACANCIES IN FOREST BELT.

Every spring it is found that a greater or less number of the trees in the forest belts have succumbed either to the severity of the winter, alternate freezing and thawing in fall and spring, or from the effects of water standing on or near the surface of the soil. Last spring 450 trees were needed to fill up the gaps caused in this way during the previous two years.

REPLACING AVENUE TREES AND ADDITION TO AVENUES.

Owing to various causes a certain proportion of the avenue trees also die each year, and this year the following numbers were required to replace those which had died. In some cases, as on the northern boundary, where the row of trees is composed of mixed species, the same kind was not always replanted.

SPECIES.

Acer saccharinum—Sugar maple	24
Acer rubrum—Red maple	21
Fraxinus Americana—White ash	10
Fraxinus viridis—Green ash	9
Fraxinus sambucifolia—Black ash	10
Tilia vulgaris—European linden	8

Last spring another avenue was formed extending from near the farm foreman's house to the northern boundary, by the planting of 46 Norway maple trees. These have all done well, except one, which died. This avenue promises to add much to the appearance of that part of the farm.

ADDITIONS TO MIXED FOREST BELT.

During the spring of 1893 there were 3,511 trees added to the mixed forest belt on the north boundary of the farm. Of these, only 163 have died, and those living seem well fitted, from their appearance at present, to survive the approaching winter.

The following is a list of the species planted, with total number of each, and the numbers which have lived and died:—

List of Species.	No. planted.	No. living.	No. dead.
Deciduous Trees.			
Acer saccharinum— Sugar maple	164	159	5
do rubrum—Red maple	198	193	5
do platanoides—Norway maple	124	124	....
do Pseudoplatanus—Sycamore maple	70	64	6
do Tartaricum—Tartarian maple	32	32	....
do campestre—English maple	31	31	....
Æsculus hippocastanum—Horse-chestnut	60	60	....
Betula alba—European white birch	191	191	....
Celtis australis—European nettle-tree	23	19	4
Catalpa hybrida—Tea's catalpa	66	66	....
Diospyros Virginiana—Persimmon	5	5	....
Fraxinus Americana—White ash	173	172	1
do viridis—Green ash	72	72	....
do sambucifolia—Black ash	61	61	....
Juglans nigra—Black walnut	165	165	....
Negundo aceroides—Box elder	298	297	1
Pyrus Americana—American mountain ash	25	24	1
do Aucuparia—European mountain ash	2	1	1
Populus alba Bolleana—Bolle's poplar	2	2	....
do certinensis—Asiatic poplar	129	129	....
Platanus occidentalis—Button-wood	2	2	....
Quercus alba—White oak	4	4	....
do macrocarpa—Burr oak	155	155	....
do rubra—Red oak	66	64	2
Rhamnus frangula—Breaking buckthorn	51	51	....
Tilia vulgaris—European linden	47	47	....
Ulmus Americana—White elm	199	197	2
do racemosa—Rock elm	69	62	7
do montana—Scotch elm	76	67	9

LIST OF SPECIES.	No planted.	No. living.	No. dead.
Evergreen Trees.			
Picea alba—White spruce	198	197	1
do excelsa—Norway spruce	290	257	33
Pinus strobus—White pine	129	102	27
do sylvestris Rigaensis—Riga pine	228	187	41
do Austriaca—Austrian pine	9	7	2
do Mughus nana—Dwarf mountain pine	78	66	12
Thuya occidentalis—Arbor-vitæ	19	16	3

EVERGREEN CLUMP.

In the year 1888 a large number of young trees was procured and planted in nursery rows to remain until they should be required for the tree belts and clumps, or for other ornamental purposes on the farm.

As several hundreds of Norway spruce, Scotch and Austrian pine had, before they were needed, grown too large for successful transplanting, it was decided to leave a clump of these, as a permanent plantation, on a rising piece of land, in a prominent place near the northern boundary of the farm.

The trees, having been planted close together, had made quite a thicket, and this year it was considered necessary to cut out a large number of them to admit light and air, and give those remaining a better opportunity to develop. The trees when thinned averaged 2½ feet apart in the rows, with the rows 3 feet apart. It is proposed to thin them still further as occasion requires.

The following table shows the average height of the trees, the average circumference, 1 foot from the ground, and the number of trees left of each species after thinning. For the double purpose of increasing the size of the clump and adding to its appearance, the rows of trees were extended to the cross road near by. The additions made this year will be found in the table.

NAMES OF SPECIES.	Average height.	Average circumference 1 foot from ground.	Number planted, 1888.	Number planted, 1893.
Picea excelsa—Norway spruce	7 feet	5 in.	273	168
Pinus sylvestris—Scotch pine	9½ "	5⅓ "	636	52
Pinus Austriaca—Austrian pine	7 "	5¾ "	621	106
Total number of trees, 1856	....	....	1,530	326

PLANTING IN POULTRY YARDS.

Although the season was far advanced, and the trees and shrubs nearly in full leaf, during the first week of June, 53 trees and shrubs were planted in the poultry yards, and notwithstanding the advanced state in which they were when planted, not one has died.

SUMMARY OF TREES AND SHRUBS PLANTED, 1893.

Trees replanted in forest belt	450
do do along avenues	82
Addition to avenues	46
do to mixed forest belt	3,511
do to evergreen clump	326
Trees and shrubs in poultry yards	53

WM. T. MACOUN.

VISITS TO THE BRANCH EXPERIMENTAL FARMS.

During 1893 it was found necessary to visit the branch farms in the west twice, the first time in May and again in August. On the first journey I left Ottawa on the 28th of April, and arrived in Chicago a day prior to the opening of the World's Columbian Exposition when an opportunity was afforded of witnessing the completion of the work in connection with the Canadian agricultural and horticultural exhibits which had been planned earlier in the season. The day following the opening ceremonies I proceeded westward.

As one of the main objects in undertaking this early journey was to reach the branch farm at Agassiz, British Columbia, in time for spring planting, only one day was spent at each of the branch farms at Brandon, Man., and Indian Head, N.W.T. on the way out, giving time only to arrange those details of farm work which were most pressing. Agassiz was reached on the 11th of May, where seven days were spent in planning and arranging the work of the year, a large share of attention being given to the planting of trees and shrubs about the Superintendent's house. These have been so grouped as to produce good effects by agreeable combinations of form and colour, and a sufficient area has been provided adjacent to the dwelling to serve the purpose of an arboretum. Over 500 specimens were planted during the period of my visit, the placing of these produced quite a transformation in the appearance of the grounds and prepared the way for giving due prominence to an exceedingly interesting feature of the work in progress there. The orchards were inspected and extensions to these planned, a nut orchard was also planted. The forest tree planting on the mountain sides in rear of the valley land was well advanced before my arrival and by the time the planting season closed over 5,000 hard-wood trees had been set out and arrangements made for the planting of a similar number each year for several years to come. The large young orchard of cherry and plum trees set out three years ago was in full bloom at the time of my visit, and presented a very handsome appearance.

I found as a result of the unusually severe winter that all the peach, apricot and nectarine trees, and most of the other sorts of comparatively tender trees and shrubs, were more or less injured and some of them killed outright. Much of the evergreen foliage of the gigantic native firs looked scorched and brown showing that even the old and long established native trees had been unable to endure without injury this unusually severe visitation, the thermometer having fallen on one occasion for a few hours as much as 12 degrees below zero. The apple, plum and cherry trees did not appear to be injured at all, and the young apple trees later on, bore a very fair crop of fruit, but from the fact of the cherry blossoms not setting and a number of the plums setting very imperfectly, it seems that the very cold weather of the winter had affected even these hardier sorts of trees. The wood of many of the young pear trees was also more or less discoloured within, showing injury which may in some instances be permanent. The spring growth however was pushing rapidly on, and Nature was doing her best to repair the damage which had been done.

The farm buildings were examined and everything found in good order, the animals of all sorts were healthy, the spring work was well advanced, most of the grain sown and much of it up and everything betokened good management and care.

A good supply of water for this farm being very much needed a sum was placed in the estimates for 1893-94 for this purpose, and during my stay I visited the source of the springs on the hillside from which it is proposed that the water should be obtained. I found the supply abundant and the quality to all appearance excellent. Subsequently a sample of this water was forwarded to Ottawa, to be analysed by the chemist of the farms who confirmed in the report of his analysis the good opinion which had been formed regarding it. I submit herewith the report of the chemist.

WATER FROM EXPERIMENTAL FARM, AGASSIZ, B. C.

A careful and thorough chemical examination of this water affords the following data in parts per million:—

ANALYSIS.

Free ammonia	·032
Albuminoid ammonia	·024
Nitrogen in nitrates and nitrites	·046
Chlorine	2·5
Oxygen absorbed in 15 min. at 80° F.	·296
do 4 hours do	·594
Total solids, at 105° C	83·6
do after ignition	60·4
Phosphates	none.

From the above figures, I judge this to be a first class water, free from all contamination—animal and vegetable—and of excellent quality.

FRANK T. SHUTT, M.A.,
Chemist, Dom. Exp. Farms.

As soon as the arrangements were completed at Agassiz, B.C., I left for Indian Head, N.W.T., where two or three days were spent in carefully inspecting the condition of the branch farm located there, inquiring into the progress made and in discussing and planning work for the future. The forest plantations had wintered well, and the benefits arising from the planting of hedges and shelter belts to break the force of the winds, which sometimes injure the crops have been so thoroughly demonstrated, that plans were prepared for bordering nearly all the roads on the farm with such windbreaks and for planting them elsewhere on the grounds where needed. Arrangements were also made for extending the area planted with ornamental and timber trees and shrubs, the collection of which now includes about ninety species and varieties which have proven hardy there. The Austrian Brome grass (*Bromus inermis*) which has been under test at the Indian Head farm for several years, has been grown with so much success, that it was decided to sow a considerable number of acres of this grass for more extended trial for hay and pasture, and a sufficient quantity of seed was procured for this purpose. The cattle and horses had come through the winter in excellent condition, the farm crops were nearly all up and looked well and the land was very clean, giving evidence of great care in its cultivation.

On the 22nd May I arrived at the branch farm at Brandon, where several days were spent in inspecting the work in hand and planning for future progress. A day or two was devoted to the laying out and planting of the grounds around the residence of the superintendent. Quite a large number of trees and shrubs were planted, consisting altogether of varieties which have been thoroughly tested, and proven hardy in that climate. A sufficient area of land has been laid out in this connection to furnish space for all the additional varieties of hardy sorts obtainable. The trees and shrubs which have been thoroughly tested for hardiness at Brandon, include about 100 species and varieties and form a most instructive and attractive group. It is expected that this number will be considerably increased during the coming season.

As the native plum had succeeded well at the experimental farm at Brandon, it was thought desirable to increase the size of the plantation. For this purpose I visited the Brandon Hills in company with the superintendent, where the trees are found growing wild, and we succeeded in obtaining quite a number of young specimens, some of which were planted at Brandon and some sent to the branch farm at Indian Head to be tested there. (When these trees were seen during my later visit to the western farms in the autumn, they were nearly all doing well). Several additional hedges and windbreaks were also planted during this visit, to afford shelter

and form dividing lines between the plantations of small and larger fruits, ornamental trees, shrubs and flowers. All the divisions of work on this farm were making good progress, the farm crops all looked well, the land was in good order and the horses and cattle healthy and in fine condition.

A very large number of the farmers of Manitoba visit this farm from year to year, seeking information on all points relating to agriculture and horticulture, and many voluntary testimonies are received from time to time in regard to the usefulness, not only of this institution, but also of all the branch farms and of the efficient manner in which the work is everywhere conducted. I returned to Ottawa on the 28th of May.

SECOND VISIT TO THE WEST.

A second journey to the Pacific Coast was made in August. On the way west I visited Madison, Wisconsin, and attended the meeting of the "Society for the Promotion of Scientific Agriculture" held in connection with that of the "American Association for the Advancement of Science." At this meeting I had the opportunity of explaining the nature of some of the work in progress for the promotion of agriculture at the Experimental Farms, and during the sessions I was honoured by being elected president of the society. I also attended some of the more important sessions of the American Association for the Advancement of Science held at the same place. Journeying westward a day was spent at the North Dakota Experiment Station at Fargo, N. D., where through the kindness of Prof. W. Hays who had charge of the experimental work in agriculture, I was shown through the buildings and over the grounds. As this institution has not been long established there has not been much time yet for tree planting and the grounds in this respect, looked very bare. There was, however, some very interesting work in progress, especially with wheat, with the view of producing new varieties by selection and also to some extent by cross fertilization. Useful experiments were also in hand in regard to a proper rotation of crops for that country.

EXPERIMENTAL FARM, BRANDON.

Two days were spent at the branch farm at Brandon, where the crops were found to be well advanced and many of the early varieties of cereals were cut. The grain which promised an abundant yield early in the season was found to be shrunken and light, owing to the rapid and premature ripening which took place there during the unusual heated term from the 5th to the 12th of August. All sorts of grain had suffered from this cause, but the injury was most apparent in the different sorts of wheat and barley. The quality of the oats was much better and the yield also of most varieties was good. The root crops owing to hot weather and light rains had not made satisfactory progress, but all sorts of small fruits were yielding well. The growth of the avenues, forest tree plantations and ornamental trees and shrubs had been good, and the general appearance and condition of the farm was both attractive and creditable.

EXPERIMENTAL FARM, INDIAN HEAD.

The Indian Head farm was next visited, and similar examinations made. Most of the crops looked remarkably well and did not appear to have suffered much injury from the hot days in August, and the farm was in excellent order. Roots, however, were backward and did not promise well. Austrian Brome grass had given an excellent yield of hay, more than three tons per acre, and the crop of all the small fruits was good. The growth of the trees, shrubs and hedges had not been so luxuriant as on the branch farm at Brandon, owing to less favourable climatic conditions but they had made satisfactory progress and have already become a pleasing feature on this prairie farm.

VISIT TO THE EDMONTON DISTRICT.

At Calgary the branch line of railway to Edmonton was taken which runs through a district I had not visited before. The country for the first fifty miles has much the same appearance as about Calgary, the grass is short and trees and shrubs are almost or entirely wanting, excepting along the margins of streams or watercourses where the moisture is sufficient to sustain them. North of this changes begin to occur, the grasses gradually increase in length and in luxuriance, clumps of shrubs and dwarfed specimens of trees are occasionally seen, and after a time these are succeeded by patches of woodland of stronger growth with stretches of open prairie adorned with clumps and occasional larger areas of timbered land. Streams and rivers also are oftener seen and by the time that half the distance between Calgary and Edmonton has been covered, the country is found to be well wooded and watered, grasses and pea-vines are luxuriant and abundant and the soil is a dark rich fertile loam. The woods afford shelter and the luxuriant herbage furnishes unlimited quantities of food for stock, making this part of the territories specially suitable for mixed farming. During the five days spent at Edmonton many of the farming settlements in the neighbourhood were visited which involved about 130 miles of driving. All through this district the grain crops looked remarkably well. The harvest was in progress during the time of my visit, and the heads of grain were plump and well-filled. For about sixty miles north of Edmonton until the height of land is crossed, the agricultural capabilities of the country appear to be much the same as those about Edmonton, but in the next forty miles which drain into the Athabasca River, the soil is said to be less fertile although this district is believed to include much excellent land. This belt of fertile country 200 miles or more in width, is said to extend westward from Edmonton more than 200 miles towards the Yellowhead Pass in the Rocky Mountains and eastward, varying in width, for several hundred miles to the shores of Lake Manitoba. At many points in this immense fertile area settlement is progressing satisfactorily, but the capacities of the district are such that millions will eventually find comfortable homes and abundant sustenance there.

EXPERIMENTAL FARM, AGASSIZ.

Returning to the main line of railway and proceeding westward a journey of about 35 hours across the mountains brought me to Agassiz, where several days were spent in examining the results of the season's growth, not only on the experimental farm, but also on the lands of the neighbouring farmers. At the time of my arrival, a drought had prevailed in this part of the country for five or six weeks and crops of all sorts were suffering for want of rain. Most of the grain was short in straw, but with heads moderately well filled, the yield however was turning out considerably under the average. The root crops were then very backward, but subsequent rains improved these considerably. In the orchards many of the young plum trees were laden with fair crops of fruit of excellent quality, a collection of which was made and forwarded to the World's Fair in Chicago, but the results with most other fruits were disappointing and the apple crop was unusually light. On the experimental farm at Agassiz, there are now more than 1,100 varieties of fruits under test, about 800 of which are large fruits and most of the trees are doing well. Some of the orchards have been planted on the valley land, others on the fertile benches at different heights on the face of the mountains varying from 100 to 800 feet. The orchards located at the highest of these points have thus far been found to have the healthiest trees and are the first to leaf out in the spring. A comparison of these with the trees planted in the valley land for a series of years will be most useful and instructive.

INQUIRIES INTO HOP GROWING AND IRRIGATION.

The subject of hop growing is now attracting much attention in some parts of British Columbia, especially in the neighbourhood of the experimental farm, where there are several large hop yards, which have given excellent crops during the past season. In order to gain all the information possible for the benefit of the growers there, it was arranged that the superintendent of the farm at Agassiz should join me in visiting the hop yards which had been established in the Fraser River Valley and also some of the more important hop districts in the State of Washington, both in the coast and dry climates of that state, so that opportunity might be afforded of comparing the hops grown there with those produced in the corresponding climates in British Columbia. After visiting the noted hop districts about Puyallup and the White River Valley a trip was made to Yakima in the dry interior of the state, where nothing can be grown without irrigation. A careful comparison seemed to leave no doubt that hops can be produced in British Columbia as good in every respect as those grown in Washington.

Returning eastward a day was spent at Spence's Bridge where some magnificent apples grown by means of irrigation were obtained and forwarded to the Canadian horticultural department at the World's Fair. One of these grown by Mr. A. Clemis was an extraordinary specimen of the variety known as Red Beitegheimer, of beautiful form and colour, which measured 15½ inches in circumference and weighed 25 ounces.

At Calgary a visit was made to the farm of Mr. Hull, a few miles from the town, where excellent crops of oats, wheat and barley had been grown during the past season by means of irrigation. Extensive works have been begun in that neighbourhood which when completed will result in the irrigation of thousands of acres of land by utilizing portions of the water in the Bow and Elbow Rivers. With a sufficient supply of moisture in the soil there is no doubt that abundant crops of grain and fodder can be grown on the fertile lands of that district. Returning homewards Ottawa was reached on the 26th of September after an absence of more than six weeks.

EXPERIMENTAL FARM, NAPPAN.

Later in the autumn the branch farm at Nappan, Nova Scotia, was visited the results of the year ascertained and arrangements made for future experimental work. This farm has been greatly improved during the past five years by a gradual extension of under-draining. A few acres have been drained each year, until now 78 acres have been so treated with manifestly beneficial results in quantity and quality of crops. Land so drained may be seeded much earlier in the spring, and the soil being kept more open and porous admits of a much better tilth, while the conditions for healthy plant growth are greatly improved. Many promising varieties of grain, roots and potatoes, have been tested, the results of early and late sowing compared, the influence of fertilizers on different crops noted and many other useful lines of experimental work conducted. The fruit plantations contain many varieties both of large and small fruits, most of which have made satisfactory progress and some of the young trees have borne fruit. The number of ornamental trees, shrubs and plants under test has been increased and useful information gained in this branch of the work. The cattle kept at this farm are almost wholly composed of dairy breeds, and the recent establishment of a cheese and butter factory, at Nappan, under charge of the Dominion Dairy Commissioner, has awakened a general interest in dairying in that part of the country and brought the experimental work carried on at the farm on dairy stock prominently into notice. Since the erection of the piggery several useful breeds of swine have been introduced which are having a good influence in improving the character of the hogs bred in this district. All the animals appeared to be healthy and the general condition of the farm was good, giving evidence everywhere of careful management.

BEE KEEPING.

For the past two years experiments have been conducted with bees at the branch farm in Brandon, Manitoba, and recently the initial steps in the direction of investigations on this important subject have been taken at the central farm and a supply of suitable material obtained. The supervision of this work will be undertaken by the entomologist of the experimental farms, Mr. James Fletcher, who will, it is expected be able to give particulars of the progress made in this department in the next annual report.

Summary of Crops at the Central Experimental Farm.

The following are the results of the harvest of 1893:—

	Bushels.
Wheat	206
Barley	251
Oats	736
Pease	191
Rye	370
Mixed grain for feed	212
Total No. of bushels	1,966

	Tons.	Lbs.
Indian corn for ensilage	440	......
Sunflower heads for ensilage	25	1,651
Horse beans "	15	273
Carrots	131	1,332
Mangels	56	1,388
Turnips	11	1,174
Potatoes	34	.....
Hay	104	......
Total No. of tons	828	1,818

CORRESPONDENCE.

The following is a summary of the letters received and despatched at the Central Experimental Farm for the first eleven months of 1893, ending November 30th, also of the bulletins and reports distributed by mail during the same period:—

——	Letters Received.	Letters Sent.
Director, (including in "letters received" reports on seed grain and in "letters sent" circulars of instruction and acknowledgment of reports received relating to distribution of seed grain)	13,733	18,213
Agriculturist	4,663	3,756
Horticulturist (including in "letters sent" circulars regarding diseases of fruits, and varieties of fruits suitable for Quebec)	1,863	2,180
Chemist	850	746
Entomologist and Botanist	1,735	1,261
Poultry manager	727	770
	23,571	26,926

Number of Reports and Bulletins mailed 227,899

METEOROLOGICAL OBSERVATIONS.

TABLE of Meteorological Observations taken at the Central Experimental Farm Ottawa, 1893; maximum, minimum, and mean temperature for each month, with date of occurrence; also rainfall and snowfall:

———	Maximum.	Date.	Minimum.	Date.	Mean.	Rainfall. — Inches.	Snowfall. — Inches.
January	40°·2	29th	—26·2	4th	3°·6	....	30·00
February	38·8	10th	—23·1	5th	9·8	0·07	29·00
March	45°·0	9th	—5·2	6th	23·2	1·04	2·50
April	65·2	13th	9·0	2nd	36.5	2·47	5·00
May	87·5	12th	33·8	26th	53·3	4·69	
June	91·5	20th	49·5	7th	68·3	4·36	
July	88·3	1st	49·0	9th	66·1	5·01	
August	94·8	10th	45·5	30th	66·8	8·68	
September	76·3	13th and 15th	34·9	26th	53·6	3·22	
October	72·9	13th	21.5	31st	48·6	1·18	
November	54·2	2nd	7·5	25th	32·6	1·07	6·00
						31 79	72·50

Rain or snow fell on 158 days during the 11 months.
Heaviest rainfall in 24 hours 1·97 in., on September 29th.
Heaviest snowfall in 24 hours 8·00 in., on January 2nd.
During May rain fell on 17 days.
October shows the lowest number of days on which rain fell during the summer months, viz., 9.

WILLIAM T. ELLIS,
In charge of Observations.

ACKNOWLEDGMENTS.

In closing this section of the report, I desire to express my obligations to all the officers composing the working staff of the several experimental farms for their ready and hearty co-operation in all departments of the work which have been planned and for the successful carrying out of the measures devised, also to the workmen for the interest they have taken in doing their part well. The success of the work has exceeded all anticipations and has gained multitudes of friends and advocates for the farms among the agriculturists and horticulturists of Canada and the most favourable comments from those best able to judge of the value of the work in other countries. The results reflect credit on all. A personal acknowledgment is specially due to those members of the Central Experimental Farm staff, who have so ably assisted me in those sections of the work of which from the beginning I have assumed the personal charge. I allude to portions of the agricultural work (by special arrangement with the agriculturist) to the forest plantations and the planting of ornamental groups of trees and shrubs, the care of the seed testing and propagating houses, and the distribution of seed grain for test. To the farm foreman, Mr. John Fixter; to the foreman in forestry, Mr. W. T. Macoun; who has also acted as my assistant in the experimental field work, to Mr. W. T. Ellis, who has had the charge of the testing and propagating houses, and to Mr. J. Kirkpatrick, who has carried on the work connected with the seed distribution, my grateful acknowledgments are due for the care and vigilance which they have shown in the management of these several divisions of the work and in collecting and preserving the data on which much of the information in this part of the report is based.

WM. SAUNDERS,
Director Dominion Experimental Farms.

REPORT OF THE AGRICULTURIST.

(JAS. W. ROBERTSON.)

To WM. SAUNDERS, Esq.,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to present reports on, (1) experiments in the fattening of cattle, (2) experiments in the feeding of swine, and (3) the Robertson mixture for ensilage.

The brevity of this report is due to two causes.

(1) The discovery that the disease of tuberculosis was widespread in our herd of cattle, led to the stoppage, for a time, of experiments in the feeding of milking cows, also to a postponement of the investigations in the Experimental Dairy. The presence of the disease of tuberculosis in a few of the cattle, had been suspected for some time; but until recently the disease was not known to be of an actively contagious nature. After it had been established that, by means of tests made by the injection of a small quantity of Koch's lymph or tuberculin, the presence of the disease in even its incipient stages could be detected, several of the animals were tested. By the steps which were taken to stamp out the disease from the herd, it became impraticable to continue the feeding of a number of cows on the crops of the 40-acre lot, which were reported on last year. A complete record of the crops of the 40-acre lot for 1893 has been taken; and it is intended that the feeding of as many cattle as can be kept on the product of it, will be resumed in 1894. For the reason mentioned, I do not consider the information available in regard to it, for the season of 1893, to be of sufficient importance to be published in its incomplete state.

(2) As in former years my duties and opportunities as Dairy Commissioner have absorbed the greater part of my time. Executive work which has arisen from the establishment and management of the Branch Experimental Dairy Stations —(there have been 19 different dairy stations under my control during the year)— has absorbed a large share of my time; the management of the exhibition of Canadian dairy products at the World's Fair claimed no few hours and days; meetings of farmers, correspondence, &c., &c., had to go sparingly served by what could be taken of it; and the planning and supervising of investigations into the feeding and management of cattle and swine and the other branches of work undertaken by me, at the Central Experimental Farm, in my capacity as Agriculturist, occupied the remainder of it. The supervision of the grain and root crops was taken by yourself, as heretofore.

For the faithful and painstaking discharge of their duties, I desire to mention with special commendation, Mr. John Fixter, farm foreman, and Mr. Robert R. Elliott, herdsman.

I have the honour to be, sir,
Your obedient servant,
JAS. W. ROBERTSON,
Agriculturist.

PART I.—THE FATTENING OF CATTLE.

Experimental tests in the fattening of steers were commenced at the Central Experimental Farm in December, 1890. The main object of the experiments was to obtain information on the comparative cost of fattening steers :—

(1.) Upon a ration of which the bulky-fodder portion was mainly **corn ensilage, hay and roots**;

(2.) Upon a ration of which the bulky-fodder portion was mainly **hay and roots**; and

(3.) Upon a ration of which the bulky-fodder portion was mainly **corn ensilage**.

For the purpose of arranging such data as would be obtained from the tests, in a manner which would be clear to the farmers and useful to them in making a comparison between the cost of feeding steers on the three different classes of rations, a cash value was estimated for the component fodders in each. The prices at which the several fodders were valued for the purposes of these comparisons, are higher than the cost of production to the ordinary farmers, and may be higher or lower than the prices which could be realized from their sale as fodders.

The values at which the calculations for the different years were made, are as follows :—

TABLE I.

——		1890-91.	1891-92.	1892-93.
		$ cts.	$ cts.	$ cts.
Corn ensilage	Per ton.	1 40	2 00	2 00
Hay	"	8 00	8 00	8 00
Roots (turnips, mangels and carrots)	"	4 00	4 00	4 00
Straw	"	4 00	4 00	4 00
Oil-cake and cotton-seed meal	"	30 00	30 00	....
Mixed grain (pease and barley)	"	20 00	20 00	20 00
Frosted wheat	"	....	12 00	12 00

The following table shows the rations which were fed in 1891-92. In 1890-91, instead of 2 lbs. of oil-cake in each ration, there were 1 lb. each of oil-cake and cotton-seed meal. Otherwise the rations were the same for the two years.

TABLE II.

Ration No. 1.	Lbs.	Ration No. 2.	Lbs.	Ration No. 3.	Lbs.
Corn ensilage	20			Corn ensilage	50
Hay (cut)	10	Hay (cut)	20		
Roots	20	Roots	40		
Straw (cut)	5	Straw (cut)	5	Straw (cut)	5
Oil-cake	2	Oil-cake	2	Oil-cake	2
Pease (ground)	2	Pease (ground)	2	Pease (ground)	2
Barley (ground)	2	Barley (ground)	2	Barley (ground)	2
	61		71		61

Feeding tests were continued during 1892-93 to obtain further data for a comparison of the economy of using the bulky-fodder portions of rations, No. 2 (**hay, roots and straw**), and No. 3 (**corn ensilage and straw**). Instead of equal

INDIAN CORN FOR FODDER AND ENSILAGE, GROWN AT THE CENTRAL EXPERIMENTAL FARM—OTTAWA.

quantities of meal being added to the different rations, an equal quantity of meal per head per day, was fed to the animals which were classed for comparison in the two groups.

Four steers (two of them 2-year-olds and two of them 1-year-olds) were arranged into Group I. and were fed on ration No. 2, as under; and four steers of similar age, quality and breeding, were put into Group II. and fed on ration No. 3, as under.

TABLE III.

Ration No. 2.	Lbs.	Ration No. 3.	Lbs.
Hay (cut)	20	Corn ensilage	50
Roots (turnips)	40		
Straw (cut)	5	Straw (cut)	5
	65		55

The animals were allowed as much of the mixture as they would eat. The meal, which was fed in addition, was a mixture of equal parts by weight of ground barley, pease and frosted wheat. The two-year-old steers in both groups were given 5 lbs. per head per day of the meal; and the one-year-old steers in both groups were given 4 lbs. per head per day of the meal. Occasionally, when the animals "were off their feed," the meal was reduced for a few days.

The two-year-old steers in both groups were fed for comparison in a test in 1891-92; and the following table of the rate of gain during the feeding period of 18 weeks at that time, shows that the animals were nearly evenly classed. In that test they were all fed on ration No. 3 (corn ensilage, straw and meal):—

TABLE IV.

——	Increase in Weight.	Feed consumed per head per day.	Cost per head per day.
	Lbs.	Lbs.	Cents.
Group I., steer No. 177	163	45·25	9·64
do do 178	173		
Group II. do 175	129	43·94	9·36
do do 176	172		

During the preparatory period, for the feeding test of 1892-93, from Oct. 6 to Nov. 22, these four steers were fed on the ordinary maintenance ration. The following table shows the gain in weight during that period.

TABLE V.

——	Weight, Oct. 6.	Weight, Nov. 22.	Gain.
	Lbs.	Lbs.	Lbs.
Group I., steer No. 177	1,105	1,105	....
do do 178	1,125	1,235	110
Group II. do 175	1,050	1,140	90
do do 176	1,050	1,180	130

The following table shows (1) the increase in weight of each steer during the first 11 weeks (from Nov. 22 to Feb. 7), (2) the quantity of the ration consumed per head per day, (3) the quantity of the meal mixture consumed per head per day, and (4) the average cost per head per day for feed consumed:—

TABLE VI.

Rations.	Increase in Weight.	Bulky-fodder per head, per day.	Meal per head, per day.	Cost per head, per day.
	Lbs.	Lbs.	Lbs.	Cents.
Hay, roots and straw, steer No. 177	127	38·29	5·01	14·35
do do 178	59	37·75	5·01	14·20
Corn ensilage and straw, steer No. 175	107	53·54	5·01	10·17
do do 176	130	55·94	5·01	10·42

The steers on the hay, roots and straw ration were not showing a good appetite, and for the remainder of the feeding period (from February 7 to May 9) ration No. 2 was made up to contain 80 lbs. of roots instead of 40 lbs.

The two rations were then as follows:—

TABLE VII.

Ration No. 2.	Lbs.	Ration No. 3.	Lbs.
Hay (cut)	20	Corn ensilage	50
Roots (turnips and carrots)	80		
Straw (cut)	5	Straw (cut)	5
	105		55

The following table shows (1) the increase in weight of each steer during the 13 weeks (from February 7 to May 9), (2) the quantity of the ration consumed per head per day, (3) the quantity of the meal mixture consumed per head per day, and (4) the average cost per head per day for feed consumed.

TABLE VIII.

Rations.	Increase in Weight.	Bulky-fodder per head, per day.	Meal per head, per day.	Cost per head, per day.
	Lbs.	Lbs.	Lbs.	Cents.
Hay, roots and straw, steer No. 177	89	48·00	4·87	15·64
do do 178	116	48·53	4·86	15·75
Corn ensilage and straw do 175	92	48·40	4·82	9·45
do do 176	100	52·41	4·90	9·95

The following table shows (1) the increase in weight of each steer for the whole feeding period of 24 weeks, (2) the increase in weight per head per day, (3) the cost per head per day, and (4) the cost per 100 lbs. of increase in weight for feed consumed.

TABLE IX.

Rations.	Meal per head per day.	Increase in Weight.	Increase per head per day.	Cost per head per day.	Cost per 100 lbs. of increase.
	Lbs.	Lbs.	Lbs.	Cents.	$
Hay, roots and straw, steer No. 177	4·94	216	1·28	15·05	11·70
do do 178	4·93	175	1·04	15·04	14·40
Corn ensilage and straw do 175	4·91	199	1·18	9·79	8·26
do do 176	4·95	230	1·36	10·18	7·43

Conclusions. From these tests it appears that:—

(1.) During the feeding period of 24 weeks, the steers which were fed upon ration No. 3 (corn ensilage, straw and meal) GAINED in weight on the average 19 lbs. per head MORE, and COST 5·06 cents per head LESS, per day for feed consumed, than the steers which were fed upon ration No. 2 (hay, roots, straw and meal);

(2.) The cost for feed consumed per 100 lbs. of increase in live weight, was 66·34 per cent greater on ration No. 2 (hay, roots, straw and meal) than it was on ration No. 3 (corn ensilage, straw and meal).

The following is a summary of the results from the feeding tests for three years with two-year old steers.

Conclusions. From the tests in 1890-91 it appears that:—

(1.) During the feeding period of 20 weeks, the steers which were fed upon ration No. 3 (corn ensilage, straw and meal), GAINED in weight, on the average, 33 lbs. per head MORE, and COST 7·33 cents per head LESS, per day for feed consumed, than the steers which were fed upon ration No. 2 (hay, roots, straw and meal);

(2.) During the feeding period of 20 weeks, the steers which were fed upon ration No. 3 (corn ensilage, straw and meal), GAINED in weight, on the average, 61½ lbs. per head MORE, and COST 3·68 cents per head LESS, per day for feed consumed, than the steers which were fed upon ration No. 1 (hay, roots, corn ensilage, straw and meal);

(3.) When the experiment was ended, the steers which were fed upon ration No. 2 (corn ensilage, straw and meal) were in the most attractive condition of the three lots for handling and selling.

Conclusions. From the tests in 1891-92 it appears that:—

(1.) During the feeding period of 18 weeks, the steers which were fed upon ration No. 3 (corn ensilage, straw and meal), GAINED in weight on the average 55½ lbs. per head MORE, and COST 3·75 cents per head LESS, per day for feed consumed, than the steers which were fed upon ration No. 2 (hay, roots, straw and meal);

(2.) During the feeding period of 18 weeks, the steers which were fed upon ration No. 3 (corn ensilage, straw and meal), GAINED in weight on the average 36 lbs. per head MORE, and COST 3·81 cents per head LESS, per day for feed consumed, than the steers which were fed upon ration No. 1 (hay, roots, corn ensilage, straw and meal);

(3.) The cost for feed consumed per 100 lbs. of increase in live weight, was 62·95 per cent greater on ration No. 2 (hay, roots, straw and meal, and 48·32 per cent greater on ration No. 1 (hay, roots, corn ensilage, straw and meal) than it was on ration No. 3 (corn ensilage, straw and meal).

Conclusions. From these tests for three years it appears that:—

(1.) On the average, the steers which were fed on ration No. 3 (corn ensilage, straw and meal) GAINED in weight on the average 35·8 lbs. per head MORE, and COST 5·38 cents LESS per head per day for feed consumed, than the steers which were fed upon ration No. 2 (hay, roots, straw and meal).

(2.) On the average of two years, the cost for feed consumed per 100 lbs. of increase in live weight, was 64·64 per cent greater on ration No. 2 (hay, roots, straw and meal) than it was on ration No. 3 (corn ensilage, straw and meal).

Feeding tests on the same two rations were carried on during the same time with four one-year old steers. These four steers, like the four two-year old steers, had been on a feeding experiment during the winter of 1891-92. The following tables show the rates of gain, etc., during that test.

TABLE X.

Breed.	Weight Dec. 1.	Weight April 5.	Increase.
	Lbs.	Lbs.	Lbs.
Shorthorn No. 174	595	850	255
Quebec " 173	480	644	164
Shorthorn " 172	600	812	212
Quebec " 171	430	605	175

TABLE XI.

Rations.	Breed.	Increase in weight per day.	Feed consumed per day.	Cost per head per day.	Cost per 100 lbs. of increase in weight.
		lbs.	lbs.	cents.	$
Hay, roots, straw and meal	Shorthorn No. 174.	2·02	35·85	12·11	5·99
do	Quebec " 173.	1·30	25·65	8·67	6·66
Corn ensilage, straw and meal	Shorthorn " 172.	1·68	39·00	8·31	4·94
do	Quebec " 171.	1·38	31·50	6·71	4·83

Conclusions. From these tests with calf steers it appears that:—

(1.) During the feeding period of 18 weeks, the steers which were fed upon ration No. 3 (corn ensilage, straw and meal) GAINED in weight on the average 16 lbs. per head LESS and COST 2·87 cents per head LESS per day for feed consumed, than the steers which were fed upon ration No. 2 (hay, roots, straw and meal);

(2.) The *cost* of feed consumed per 100 lbs. of increase in live weight, was 27·6 *per cent greater*, on ration No. 2 (hay, roots, straw and meal), than it was on ration No. 3 (corn ensilage, straw and meal).

(3.) The *cost* of feed consumed per 100 lbs. of increase in weight was *lowest* in the case of a calf steer of "French Canadian" or "Quebec Jersey" breed, fed upon ration No. 3 (corn ensilage, straw and meal).

In the test of 1892-93, the two steers which had been on ration No. 2 (hay, roots, straw and meal) in 1891-92, were again put on that ration; and the other two steers were put as in the former test, on ration No. 3 (corn ensilage, straw and meal).

They were allowed as much of the bulky-fodder part of the rations as they would eat; and each steer was given 4 lbs. of the mixed meal (barley, pease and frosted wheat) per day.

Ration No. 2 was altered for them also after February 7th by the addition of 40 lbs. of roots as in table VII.

The following tables show (1) the increase in weight of each steer for the whole feeding period of 24 weeks, (2) the increase in weight per head per day, (3) the quantity of the ration consumed per head per day, (4) the quantity of the meal mixture consumed per head per day, (5) the cost per head per day, and (6) the cost per 100 lbs. of increase in weight, for feed consumed.

TABLE XII.

Rations.	Breed.	Weight Nov. 22.	Weight May 9.	Increase in weight.	Increase per head per day.
		lbs.	lbs.	lbs.	lbs.
Hay, roots and straw	Shorthorn No. 174.	1,060	1,221	161	·95
do	Quebec " 173.	830	955	125	·74
Corn ensilage and straw	Shorthorn " 172.	1,015	1,225	210	1·25
do	Quebec " 171.	795	986	191	1·13

TABLE XIII.

Rations.	Breed.	Bulky-fodder per head per day.	Meal per head per day.	Cost per head per day.	Cost per 100 lbs. of increase.
		lbs.	lbs.	cents.	$
Hay, roots and straw	Shorthorn No. 174.	42·30	3·95	13·89	14·50
do	Quebec " 173.	30·74	3·79	10·91	14·66
Corn ensilage and straw	Shorthorn " 172.	48·19	3·95	8·67	6·94
do	Quebec " 171.	40·80	3·95	7·87	6·92

Conclusions. From these tests, it appears that:—

(1.) During the feeding period of 24 weeks, the steers which were fed upon ration No. 3 (corn ensilage, straw and meal) GAINED in weight on the average 57·5 lbs. per head MORE and COST 4·13 cents per head LESS, per day for feed consumed, than the steers which were fed upon ration No. 2 (hay, roots, straw and meal).

(2.) The cost of feed consumed per 100 lbs. of increase in live weight, was 110·39 per cent greater on ration No. 2 (hay, roots, straw and meal) than it was on ration No. 3 (corn ensilage, straw and meal);

(3.) The cost of feed consumed per 100 lbs. of increase in weight was lowest in the case of a Shorthorn steer; but taking the tests for the two years (1891-92 and 1892-93), the cost of feed consumed per 100 lbs. of increase in weight, was slightly lowest in the case of a steer of the "French Canadian" or "Quebec" breed, fed upon corn ensilage, straw and meal.

THE FEEDING OF HEIFERS.

Two grade Shorthorn heifers were also fed on ration No. 2 (hay, roots and straw) and one grade Shorthorn and one Holstein heifer, of about similar age and quality, were fed on ration No. 3 (corn ensilage and straw). A grade Holstein steer was also fed with these two heifers on ration No. 3.

They were allowed as much of the bulky-fodder part of the ration as they would eat; and each animal was given 4 or 5 lbs. of the mixed meal (barley, pease and frosted wheat) per day. Ration No. 2. was altered for them also after February 7th by the addition of 40 lbs. of roots, as in Table VII.

The following tables show (1) the increase in weight of each animal for the whole feeding period of 24 weeks, (2) the increase in weight per head per day, (3) the quantity of the ration consumed per head per day, (4) the quantity of the meal mixture consumed per head per day, (5) the cost per head per day, and (6) the cost per 100 lbs. of increase in weight, for feed consumed.

TABLE XIV.

Ration.	Name of steer.	Weight, — Nov. 22.	Weight — May 9.	Increase in weight.	Increase per head per day.
		Lbs.	Lbs.	Lbs.	Lbs.
Hay, roots and straw...........	Ida.	850	1,021	171	1·01
do do	Rose.	1,065	1,280	215	1·28
Corn ensilage and straw.........	Queen.	900	1,183	283	1·68
do do	Ethel.	1,065	1,272	207	1·23
do do	Baron.	885	1,163	278	1 65

TABLE XV.

Ration.	Name of steer.	Bulky fodder per head per day.	Meal per head per day.	Cost per head per day.	Cost per 100 lbs. of increase.
		Lbs.	Lbs.	cents.	$
Hay, roots and straw.............	Ida.	40·16	3·92	13·32	13·09
do do	Rose.	43·34	4·94	15·01	11·73
Corn ensilage and straw....... ..	Queen.	52·22	3·94	9·11	5·41
do do	Ethel.	53·20	4·88	10·03	8·14
do do	Baron.	52·98	3·95	9·20	5·56

Conclusions. From these tests it appears that:—

(1.) During the feeding period of 24 weeks, the animals which were fed upon ration No. 3 (corn ensilage, straw and meal) GAINED in weight on the average 63 lbs. per head MORE and COST 4·72 cents per head LESS, per day, for feed consumed, than the animals which were fed upon ration No. 2 (hay, roots, straw and meal);

(2.) The cost for feed consumed per 100 lbs. of increase in live weight, was 94·82 per cent greater on ration No. 2 (hay, roots, straw and meal) than it was on ration No. 3 (corn ensilage, straw and meal).

The following tables show the average of the results from the six animals fed upon ration No. 2 (hay, roots, straw and meal) and from the seven animals fed upon ration No. 3 (corn ensilage, straw and meal) for the whole feeding period of 24 weeks:—

TABLE XVI.

Ration.	———	Weight, Nov. 22.	Weight, May 9.	Increase in weight.	Increase per head per day.
		Lbs.	Lbs.	Lbs.	Lbs.
Hay, roots and straw....	Average of six animals...	1,024	1,201	177	1·05
Corn ensilage and straw.	Average of seven animals.........	997	1,225	228	1·35

TABLE XVII.

Ration.	——	Bulky-fodder per head per day.	Meal per head per day.	Cost per head per day.	Cost per 100 lbs. of increase.
		Lbs.	Lbs.	cents.	$
Hay, roots and straw....	Average of six animals............	44·00	4·41	13·87	13·35
Corn ensilage and straw.	Average of seven animals.........	50·31	4·36	9·26	6·95

Conclusions. From these tests it appears that:—

(1.) During the feeding period of 24 weeks, the animals which were fed upon ration No. 3 (corn ensilage, straw and meal) GAINED in weight on the average 51 lbs. per head MORE, and COST 4·61 cents per head LESS per day for feed consumed, than the animals which were fed upon ration No. 2 (hay, roots, straw and meal);

(2.) The cost for feed consumed per 100 lbs. of increase in live weight, was 92·08 per cent greater on ration No. 2 (hay, roots, straw and meal), than it was on ration No. 3 (corn ensilage, straw and meal);

(3.) The *cost* of feed consumed per 100 lbs. of increase in weight was *lowest* in the case of a grade Shorthorn heifer (viz., $5.44 per 100 lbs. of increase in weight), fed upon ration No. 3 (corn ensilage, straw and meal).

PART II.—THE FEEDING OF SWINE.

The experiments in the feeding of swine during 1893 were mainly directed towards gaining information on the quantities of grain consumed per pound of increase in live weight by swine of different breeds or breeding. Incidentally, tests with the use of frosted wheat as the whole or part of the ration were continued.

First Series.

A series of experiments was commenced with four pens of swine of different breeding, by feeding them on frozen or frosted wheat, ground and soaked in cold water for an average of 18 hours. The swine in every pen were weighed once a week.

TABLE I.

Pen No. 1 contained 3 swine, crossbred by *Berkshire* sire and *Poland-China* dam

——	Oct. 3.	Oct. 31.	Nov. 28.	Dec. 26.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight..	329	469	589	630	....
Increase in weight.	....	140	120	41	301
Feed consumed	....	585½	565½	364	1,515
do per lb. of increase in live weight	....	4·17	4·71	8·87	5·03

TABLE II.

Pen No. 2 contained 4 swine, grades by *Improved Large Yorkshire* sire and *Berkshire Grade* dam.

——	Oct. 3.	Oct. 31.	Nov. 28.	Dec. 26.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight	376	499	642	746	....
Increase in weight	....	123	143	104	370
Feed consumed	....	624	631	608	1,863
do per lb. of increase in live weight	....	5·07	4·41	5·84	5·03

TABLE III.

Pen No. 3 contained 2 swine, crossbred by *Improved Large Yorkshire* sire and *Berkshire* dam.

——	Oct. 3.	Oct. 31.	Nov. 28.	Dec. 26.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight	256	331	398	426	....
Increase in weight	....	75	67	28	170
Feed consumed	....	371½	342	232	945½
do per lb. of increase in live weight	....	4·93	5·10	8·28	5·56

TABLE IV.

Pen No. 4 contained 3 swine, purebred *Improved Large Yorkshires.*

——	Oct. 3.	Oct. 31.	Nov. 28.	Dec. 26.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight	275	338	405	314*	....
Increase in weight	....	63	67	42	172
Feed consumed	....	370	364	276	1,010
do per lb. of increase in live weight	....	5·87	5·43	6·57	5·87

* 2 swine only.

Conclusions. From these tests with 12 swine, which were continued 12 weeks, it appears that:—

(1.) On the average 5·26 lbs. of frosted wheat were consumed per pound of increase in the live weight.

Second Series.

A series of experiments was commenced with five pens of swine of different breeds or breeding, by feeding them all on the same ration,—a mixture of equal parts by weight of barley and frosted wheat, both ground and soaked in cold water for an average of 30 hours. After the first week a quantity of pulped carrots, equal to one-fifth of the weight of grain consumed, was given.

TABLE V.

PEN No. 1 contained 4 swine, purebred *Improved Large Yorkshires.*

—	Feb. 7.	Mch. 7.	Apl. 4.	May 2.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight	756	793	825	944	....
Increase in weight	....	37	32	119	188
Feed consumed { grain	....	322	325	450	1,097
Feed consumed { carrots	....	45	65	90	200
do per lb. of increase in live weight { grain	....	9·91	12·18	4·53	5·83
do per lb. of increase in live weight { carrots	....	....	....	....	1·06

TABLE VI.

PEN No. 2 contained 4 swine, purebred *Tamworths.*

—	Feb. 7.	Mch. 7.	Apl. 4.	May 2.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight	457	524	593	691	....
Increase in weight	....	67	69	98	234
Feed consumed { grain	....	394	315	400	1,109
Feed consumed { carrots	....	58	63	80	201
do per lb. of increase in live weight { grain	....	6·74	5·47	4·89	4·74
do per lb. of increase in live weight { carrots	....	....	....	....	·86

TABLE VII.

PEN No. 3 contained 3 swine, purebred *Berkshires.*

—	Feb. 7.	Mch. 7.	April 4.	May 2.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight	351	420	469	558	....
Increase in weight	....	69	49	89	207
Feed consumed { grain	....	299	245	320	864
Feed consumed { carrots	....	45	49	64	158
do per lb. of increase in live weight { grain	....	4·98	6·00	4·31	4·17
do per lb. of increase in live weight { carrots	....	....	....	....	·76

TABLE VIII.

PEN No. 4 contained 4 swine, crossbred by *Improved Large Yorkshire* sire and *Poland China* dam.

—	Feb. 14.	Mch 14.	Apl. 11.	May 9.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight	479	571	654	757	....
Increase in weight	....	92	83	103	278
Feed consumed { grain	....	450	335	445	1,230
Feed consumed { carrots	....	90	67	89	246
do per lb. of increase in live weight { grain	....	5·86	4·84	5·18	4·42
do per lb. of increase in live weight { carrots	....	....	....	....	·89

TABLE IX.

PEN No. 5 contained 6 swine, crossbred by *Improved Large Yorkshire* sire and *Essex* dam.

—	Feb. 14.	Mch. 14.	Apl. 11.	May 9.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight	420	505	633	809	....
Increase in weight	....	85	128	176	389
Feed consumed — grain	....	475	395	600	1,470
Feed consumed — carrots	....	95	79	120	294
do per lb. of increase in live weight — grain	....	6·70	3·70	4·09	3·77
do per lb. of increase in live weight — carrots	....	....	....	....	·76

Conclusions. From these tests with 21 swine, which were continued for 12 weeks, it appears that:—

(1.) On the average, 4·45 lbs. of barley and frosted wheat, both ground and soaked, plus ·85 lbs. of pulped carrots, were consumed per pound of increase in the live weight.

Third Series.

A series of experiments was commenced with eight pens of swine of different breeds or breeding by feeding them all on the same ration—a mixture of equal parts (by measure) of ground barley, rye, frosted wheat and bran. All the grain was ground and soaked in cold water for an average of 8 hours from August 23 to November 8 and for an average of 18 hours thereafter.

TABLE X.

PEN No. 1 contained 5 swine, crossbred by *Berkshire* sire and *Poland China* dam.

—	Aug. 23.	Sep. 20.	Oct. 18.	Nov. 15.	Dec. 6.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight	418	534	643	742	807	....
Increase in weight	....	116	109	99	65	389
Feed consumed	....	446	460	396	297	1,599
do per lb. of increase in live weight	....	3·84	4·22	4·00	4·57	4·11

TABLE XI.

PEN No. 2 contained 2 swine, crossbred by *Berkshire* sire and *Tamworth* dam.

—	Aug. 23.	Sep. 20.	Oct. 18.	Nov. 15.	Dec. 6.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight	188	224	276	320	346	....
Increase in weight	....	36	52	44	26	158
Feed consumed	....	171	163	171	133	638
do per lb. of increase in live weight	....	4·75	3·13	3·88	5·11	4·03

TABLE XII.

PEN No. 3 contained 5 swine, crossbred by *Berkshire* sire and *Improved Large Yorkshire* dam.

—	Aug. 23.	Sep. 20.	Oct. 18.	Nov. 15.	Dec. 6.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight.............	248	319	394	482	544	....
Increase in weight........	....	71	75	88	62	296
Feed consumed.	....	252	280	304	266	1,102
do per lb. of increase in live weight............	....	3·54	3·73	3·45	4·29	3·72

TABLE XIII.

PEN No. 4 contained 5 swine, crossbred by *Improved Large Yorkshire* sire and *Berkshire* dam.

—	Aug. 23.	Sept. 20.	Oct. 18.	Nov. 15.	Dec. 6.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight..............	210	281	345	394	430	....
Increase in weight	....	71	64	49	36	220
Feed consumed...........	....	210	206	200	181	797
do per lb. of increase in live weight............	....	2·95	3·21	4·08	5·02	3·62

TABLE XIV.

PEN No. 5 contained 5 swine, crossbred by *Essex* sire and *Improved Large Yorkshire* dam.

—	Aug. 23.	Sept. 20.	Oct. 18.	Nov. 15.	Dec. 6.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight................	205	256	310	373	417	....
Increase in weight........	....	51	54	63	44	212
Feed consumed...........	....	221	235	245	205	906
do per lb. of increase in live weight.........	....	4·33	4·35	3·88	4·63	4·27

TABLE XV.

PEN No. 6 contained 5 swine, crossbred by *Essex* sire and *Improved Large Yorkshire* dam.

—	Aug. 23.	Sep. 20.	Oct. 18.	Nov. 15.	Dec. 6.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight	225	295	363	431	490	.. ..
Increase in weight........	....	70	68	68	59	265
Feed consumed...........	....	256	256	258	220	990
do per lb. of increase in live weight............	....	3·65	3·76	3·79	3·70	3·73

TABLE XVI.

PEN No. 7 contained 4 swine, grades by *Tamworth* sire and *Berkshire Grade* dam.

——	Sep. 6.	Oct. 4.	Nov. 1.	Nov. 29.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight	210	270	352	452	....
Increase in weight	....	60	82	100	242
Feed consumed	....	209	230	346	785
do per lb. of increase in live weight	....	3·48	2·80	3·46	3·24

TABLE XVII.

PEN No. 8 contained 5 swine purebred, *Improved Large Yorkshires.*

——	Sep. 6.	Oct. 4.	Nov. 1.	Nov. 29.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight	241	293	348	411	....
Increase in weight	....	52	55	63	170
Feed consumed	....	241	181	242	664
do per lb. of increase in live weight	....	4·63	3·29	3·84	3·90

Conclusions. From these tests with 36 swine, which were continued 15 weeks and 12 weeks, it appears that:—

(1.) On the average, 3·83 lbs. of a mixture of barley, rye, frosted wheat (all ground), and bran were consumed per pound of increase in the live weight.

The tests are being continued with the swine in these pens.

PART III.—THE ROBERTSON MIXTURE FOR ENSILAGE.

For a few years I have been seeking to find and put into the silo with Indian corn, some other fodder plant or plants, which would furnish the quantity of albuminoids necessary to make a well-balanced ration in a form which would cost much less than ripened cereals or concentrated by-products, such as oil-meal, cotton-seed meal or bran. Clovers and pease were tried with indifferent success, and the climbing or pole beans have been grown with cornstalks for trellis without appreciable advantage. It is desirable that ensilage should contain, besides the albuminoids and carbo-hydrates such as may be found in Indian corn and horse beans, a larger quantity of fat than these plants contain. In a country with such a climate as prevails in Canada during the winter, it seems advisable to provide a winter ration for cattle containing a fairly large proportion of fat, as a bland, heat-producing part of a ration in a cheap and palatable form. I venture to believe that we have now secured that in the heads of sunflowers.

The horse bean or small field bean (*Faba vulgaris*, variety *equina*) seems to meet the case, so far as the albuminoids are concerned. This plant grows with a stiff, erect stem of a quadrangular shape. It attains in Canada a height of from 3 feet to 6 feet. It bears pods from within 6 or 8 inches from the base of the stalk to near its top. The beans when ripened are of a grayish-brown colour, and of oblong round shape, about ½-inch in long diameter and from ⅜ to a ¼-inch in short diameters. Plants have carried ripened beans in the lower pods, while the topmost ones on the same stalks were hardly out of bloom.

The sunflower (*Helianthus annuus*) grows luxuriantly over the whole of the temperate zone on this continent, and the seeds contain a large percentage of fat. The variety known as *Mammoth Russian* has been grown in rows 3 feet apart, and it appears to do best when the plants are from 12 to 18 inches apart in the rows. The following table shows the constituents of the horse beans and sunflower heads, as analysed by Mr. Frank T. Shutt, Chemist, Dominion Experimental Farms:—

ANALYSES IN 1892.

——	Water.	Albuminoids.	Fat.	Carbohydrates.	Fibre.	Ash.	Dry matter.
	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.
Horse beans	89·24	2·75	·73	2·26	3·71	1·09	10·76
do	86·15	2·69	·66	4·17	4·98	1·35	13·85
Sunflower heads with seeds	75·62	2·35	4·86	7·88	7·94	1·35	24·38
	Lbs. per ton.	Lbs. per ton.	Lbs. per ton.	Lbs. per ton.	Lbs. per ton.	Lbs. per ton.	Lbs. per ton.
Horse beans	1784·8	55·0	14·6	45·2	74·2	21·8	215·2
do	1723·0	53·8	13·2	83·4	99·6	27·0	277·0
Sunflower heads with seeds	1512·4	47·0	97·2	157·6	158·8	27·0	487·6

A brief test of the feeding of a group of cows, for 70 days during the early part of the year, was made on a ration composed of:—

	Pounds.
Corn ensilage	40
Roots	50
Straw	8
Mixed meal	4

A similar group of cows was fed on the following ration, wherein the ensilage contained Indian corn at the rate of 12 parts to 1 part of sunflower heads:—

	Pounds.
Corn ensilage and sunflower heads	40
Roots	50
Straw	8
Meal	2

No appreciable difference in the quantity or quality of the milk, as to its percentage of solids from the different groups of cows, could be traced or attributed to the different rations upon which they were fed. After both groups of cows had been fed for two weeks on the different mixtures, tests were made to discover if any difference appeared in the quality of the milk from the different groups, in regard to the readiness with which the cream could be separated by the setting method, or in the quality of the butter which was obtained from it.

The following table shows the average of the tests of nine days' milk from the two groups of cows. The test was commenced on 20th February. The milk from both groups was treated exactly alike. The setting was in deep pails in ice water for 22 hours.

—	With corn ensilage.	With corn ensilage and sunflower heads.
Lbs. of milk	122	121
Per cent of butter-fat	3·79	3·54
Lbs. of butter-fat	4·62	4·28
Lbs. of skim-milk	97	96
Per cent of butter-fat in skim-milk	**·50**	**·35**
Lbs. of butter-fat in skim-milk	·49	·34
Lbs. of cream	25	25
Per cent of butter-fat in cream	16·52	15·76
Lbs. of butter-fat in cream	4·13	3·94
Lbs. of butter-milk	21·50	22·50
Per cent of butter-fat in butter-milk	·40	·30
Lbs. of butter-fat in butter-milk	·09	·07
Lbs. of marketable butter	5·00	4·75
Lbs. of milk per lb. of butter	24·40	25.47
Lbs. of butter per 100 lbs. of milk	4·10	3·93
Per cent of butter-fat unrecovered	**12·34**	**9·58**
Lbs. of butter per lb. of butter-fat in milk	1·08	1·11

Butter from both groups was examined on 15th March, when it was found that the butter from the sunflower lot, was of richer flavour and a little higher colour than the other.

In order to obtain reliable information upon the methods of growing these three plants, Indian corn, horse beans and sunflowers, in the most advantageous manner in different parts of the Dominion, arrangements were made for distributing a small quantity of seeds, at cost price, to a number of farmers in different localities. Our experience in 1892 had pointed in the direction of planting the horse beans and corn mixed in the same rows, and the following circular of directions was sent to the farmers to whom seed was supplied :—

Central Experimental Farm,

Ottawa, 20th April, 1893.

Circular of Directions for the Robertson Mixture for Ensilage.

Soil.

If a field with a drained, warm, loamy soil be convenient to the silo, and can be used, it should be selected in preference to a heavy clay or wet soil. In all cases, the land should receive a liberal dressing of manure, be ploughed in the spring, and be harrowed to a state of fine tilth before the seeds are planted.

Time to Plant.

The time at which Indian corn for fodder may be planted with the best results, is the best time at which to plant or sow these seeds also. In most districts that period is during the last ten days of May, or late enough in the season to escape frosts at night, and early enough to give the plants the advantage of as long a season for growing as is practicable. The horse beans and sunflowers are less liable to injury from frost than Indian corn.

How to Plant.

The Indian corn and horse beans (which have been mixed) are to be planted in rows 3 feet apart, with from 2 to 4 grains per lineal foot in every row. A horse-power corn-planter or seed drill may be used for that purpose. Or they may be planted in hills 3 feet apart both ways, with from 6 to 10 grains in every hill. A horse-power or hand corn-planter may be used. If none of these implements and no other suitable planter be available, furrows 3 inches deep may be ploughed 3 feet apart. The seeds may be put in them and covered, after which the field should be rolled.

The sunflower seeds are to be planted by themselves, in rows 3 feet apart with not more than 3 or 4 seeds per foot in the row. They may be planted with a small hand planter, or by a method similar to the one which is used with the Indian corn and horse beans.

Depth of Planting.

All the seeds should be planted to a depth of from 2 to 3 inches.

Cultivation.

Only in cases where a crust forms on the land, before or immediately after the plants come up, a light harrowing will prove helpful to the crop. The cultivation between the rows, when the plants are small, should be close to them; when the plants have grown to a height of 2 feet, it should be more distant and shallow, in order not to injure the side roots.

Cutting in the Field.

The crop is to be cut when the Indian corn reaches the "glazing" stage of growth, that is when the ears are just past the best condition for table use.

The corn and beans may be cut by hand or by any of the devices in use for cutting fodder corn in the field.

The heads only of the sunflowers are to be used. They may be cut by a common reaping hook or other knife. They may be put directly into a wagon or cart, or into a basket or into heaps, from which they may be loaded afterwards.

Putting into the Silo.

When the Indian corn has reached the "glazing" stage of growth, the crop is to be put into the silo without wilting or drying; but if and when it has not reached the "glazing" stage before frost comes, it is to be cut and left to wilt or dry in the field for about one day.

The corn and beans (from two acres) are to be cut in lengths of from ½-inch to 1-inch and put into the silo; and the heads only (from half an acre) of sunflowers are to be cut with them. They may be fed through the cutting-box on and with the corn and beans.

A fairly even distribution of the mixture should be made in the silo, while it is being filled. If the leaves and lighter parts are permitted to flutter into one place, and the stalks, ears and heavier portions are allowed to settle by themselves, the ensilage will not keep well.

The mixture is to be tramped thoroughly around the sides and in the corners of the silo.

A thin layer of uncut cornstalks should be put between the "ROBERTSON MIXTURE" and the other contents (if any) of the silo, in order to mark the exact place in the ensilage.

After the silo is filled, the surface should be levelled and thoroughly tramped; and after the lapse of not more than one day, it should be covered to a depth of 6 inches with cut straw or cheap fodder. If this be tramped occasionally, and a foot of cut straw be put on top of that a few days later, probably no waste ensilage will be found on the opening of the silo for feeding.

Feeding the Ensilage.

The "ROBERTSON MIXTURE" is to be fed with 4 lbs. less meal or grain per 50 lbs. of ensilage, than has been required with ordinary Indian corn ensilage, to make an economical ration for feeding milking cows and fattening cattle.

Silo.

Ensilage has come to mean any kind of fodder which is cured and preserved in a succulent state for the feeding of domestic animals. The silo has no power to add any nutrient to the fodder which is put into it for preservation. Its contents may become more digestible and palatable by the changes which proceed slowly under the action of ferments, or they may become less pleasant and wholesome, if fermentation goes too far.

Fodder which is deficient in nutrients before it is put into a silo, will experience no regeneration there. Degeneration into offensive material is the only and constant tendency.

To prevent deterioration and decay is the function of the silo; and to that end it should be constructed to exclude the atmosphere. To do so requires the use of building material of adequate strength. The fastening of the parts, at the foundation and at the corners of the silo, should be secure. I have found one ply of sound, 1-inch lumber, tongued and grooved, and nailed horizontally on the inside of studs 2 inches by 10 inches or 2 inches by 12 inches, to be sufficient.

A clay or earthen floor is most economical and is as good as any that can be put in.

Report on results.

Please keep a record of:—

(1) How the soil was prepared;
(2) How the seeds were planted;
(3) The date of planting;
(4) The date of cutting;
(5) The stage of growth attained by the different plants of the mixture;
(6) The yield per acre of Indian corn and horse beans;
(7) The yield per acre of sunflower heads;
(8) Any unusual condition of weather such as heavy storm, frost, etc.;
(9) Any other occurrence or condition which may affect the crop.

A form upon which to report, will be sent to you in due season. Please fill it up carefully and return it here.

Letters on official business can be sent free of postage.

WM. SAUNDERS,
Director.

JAS. W. ROBERTSON,
Agriculturist.

On the Experimental Farm here, the mixture was planted in accordance with these directions, and tests were also made by the planting of the corn and horse beans in alternate rows, and by the growing of the horse beans in rows, by themselves. The following shows the results obtained from the different methods of planting:—

A plot of nearly 3 acres was planted on June 3rd with *Thoroughbred White Flint* corn and horse beans of the *Granton* variety. The soil on one quarter of the plot was light sandy loam and on the remaining three quarters was heavy sandy loam. A dressing of cattle-stable manure was applied at the rate of 10 or 12 tons per acre,

and was ploughed in. 18½ lbs. of corn and 30 lbs. of horse beans were mixed, and put on per acre in rows three feet apart. The crop came up irregularly, and on June 10th it was harrowed with light harrows. The cultivation was similar to that for an ordinary Indian corn crop.

On October 2nd the corn plants had reached the late milk stage; and the bean stalks were fairly well podded although the crop of them was thin. Three representative rows of 100 feet each were cut, and the corn and bean plants were weighed separately. The beans weighed 9·31 per cent of the whole crop. When the crop was cut for the silo on 12th October, it was found that the yield was 40 tons 1,434 lbs. from 2·827 acres. That was at the rate of 14 tons 806 lbs. per acre; or 12 tons 144 lbs. of Indian corn and 1 ton 662 lbs. of horse beans.

A plot of 5 acres was planted on 1st June with *Longfellow* corn and horse beans of the *Granton* variety. The soil of the plot was clay loam and sandy loam. No manure was applied. 18½ lbs. of corn and 30 lbs. of horse beans were mixed, and put on per acre in rows three feet apart. The crop came up on 9th and 10th June and was harrowed on 9th June with light harrows.

On 2nd October the corn plants had reached the glazing or almost ripe stage; and the beans were nearly all ripe. Three representative rows of 100 feet each were cut and the corn and bean plants were weighed separately. The beans weighed 6·3 per cent of the whole crop. When the crop was cut on 10th October, it was found that the yield was 67 tons 1,905 lbs. from 5 acres. That was at the rate of 13 tons 1,181 lbs. per acre; or 12 tons 1,469 lbs. of Indian corn and 1,712 lbs. of horse beans.

A plot of 4 acres was planted on 6th July, with *Compton's Early* corn and horse beans of the *Granton* variety. The soil was a light sandy loam. A light dressing of cattle-stable manure—about 8 tons per acre—had been applied in the fall. The plot was then sown on 3rd September with fall rye of the *Reading Giant* variety. The rye was cut on 19th June, a light dressing of manure was ploughed in, and corn and beans were planted on 26th June. The crows pulled up most of the corn and the plot was replanted on 6th July, at the rate of 18½ lbs. of corn and 30 lbs. of horse beans, per acre, mixed in the same rows, which were three feet apart.

On 2nd October, the corn plants had reached the early milk stage; and the beans were mostly in flower with a few pods at the lower ends. Three representative rows of 100 feet each were cut and the corn and bean plants were weighed separately. The beans weighed 19·78 per cent of the whole crop. When the crop was cut on 14th to 16th October, it was found that the yield was 39 tons 1,335 lbs. from 4 acres. That was at the rate of 9 tons 1,834 lbs. per acre; or 7 tons 1,912 lbs. of Indian corn and 1 ton 1,922 lbs. of horse beans.

In plots where the horse beans were grown in alternate rows with Indian corn, the beans were a comparative failure. That appeared to be attributable mainly to the unfavourable weather which prevailed.

A plot of 2 acres was planted on 1st June, with several varieties of horse beans, in rows three feet apart. The soil was a clay loam which had been cropped with barley in 1892. No manure was applied. The beans were planted with a force feed seed drill, with only two spouts running, and at the rate of two-thirds of a bushel per acre. They were planted 1st June, and came up 11th June. They were cut 16th October, and left to wilt in the field for two days before they were weighed and put into the silo. The lower pods on the stalks were filled and ripened, and the upper pods were green, with the beans not quite firm.

The following are the yields per acre of the different varieties, weighed after being wilted for two days:

Horse Beans.

Granton variety	9	tons	1,717	lbs.	per acre.
Tick do	9	do	1,252		do
Carse do	7	do	1,631		do
Kilbride do	7	do	1,057		do
Mazagan do	7	do	979		do
Average	8	tons	927	lbs.	per acre.

The cost of labour for growing 2 acres of horse beans was as follows :—

Rent of land, @ $3 per acre	$ 6 00
Ploughing, @ $2 per acre	4 00
Harrowing 3 times, rolling once	1 60
Seed, $1\frac{1}{3}$ bushels	2 00
Sowing, 3 hours of team	0 75
Cultivating, single horse, 2 days @ $1.50	3 00
Hoeing, 10 days	12 50
Cutting with scythe, 2 days	2 50
Loading, 3 days	3 75
Drawing to silo, $1\frac{2}{10}$ days of team	3 00
Proportion of time of farm foreman	4 00
Total	$ 43 10

These figures do not include any allowance for the use of farm machinery, nor do they include any amount as an equivalent for the exhaustion of soil. The cost for labour was $21.55 per acre. The average yield of the horse beans was 8 tons 927 lbs. per acre, which gives an average cost of $2.55 per ton for labour of growing, including cost of seed and rent of land.

The season in point of weather was a most unusual one over the western part of the province of Quebec and over nearly the whole of the province of Ontario. While many sections were parched with drought from June until August, the rains on the Experimental Farm here were frequent and unusually heavy. Two very severe storms swept over the farm, breaking down the cornstalks and levelling to the ground four-fifths of the sunflower stalks on the different areas on which they were planted. For that reason, the results in our trial of sunflowers during the past season cannot be taken as what might be expected in the average of years. The sunflowers in 1892 were such an average crop, as might be obtained where it was not injured by any unusual occurrence. The yield in 1892 was $7\frac{1}{2}$ tons of sunflower heads per acre.

As yet, reports have been received from only some 60 farmers, who gave the mixture a trial during the last summer. On account of the unusual weather, the bean crop appears to have been a total or almost total failure in most places in the province of Ontario. In the Maritime Provinces, where the rainfall and temperature were nearer the normal, the reports are favourable and indicate what might be expected in other parts of Canada, when regard is had to the time of planting which is most suitable for the different localities. I quote the following from reports received from some farmers in the provinces of New Brunswick and Quebec :—

In all these cases, the mixture was planted according to the directions in the circular which accompanied the seeds, with the corn and beans mixed in the same rows, and the sunflowers grown in rows by themselves.

From Mr. Z. R. Estey, Lower French Village, York Co., N.B.

"Q. Beans: Were the pods formed, filled or ripened?—A. Mostly filled and ripened, and shelling considerably.

Average height of plants? Four feet.

Yield per acre? Eleven tons of corn with four tons of beans.

Yield per acre of sunflower heads? Five or six tons.

General Remarks:—The beans I am convinced should be planted later than the *Longfellow* corn."

From Mr. Abram Alward, Butternut Ridge, Westmoreland Co., N. B.

"Q. Beans: Were the pods formed, filled or ripened?—A. Some stalks contained a large number of pods, some ripened at bottom, other stalks contained no pods, blossoms seemed to be blighted.

Average height of plants? Three feet six inches.

Yield per acre? Of sunflower heads, about 200 bushels; of corn and beans, about eight tons, green weight, of which there were five tons of corn and three tons of beans.

General Remarks: I am fully convinced that by planting the horse beans *early* with the corn, one can increase the yield per acre from 3 to 4 tons without injury to the corn in any way, and the beans seem to grow better and fill fully as well among the corn, as they do planted separate."

From Mr. E. C. Cole, Moncton, Westmoreland Co., N. B.

"Q. Beans: Were the pods formed, filled or ripened?—A. Pods formed very well along whole length of stalk, ripened near butt, and fairly well filled half way up.

Average height of plants? Three feet.

Yield per acre? Of sunflower heads, seven tons; of corn and beans, about twelve tons; of which three-fourths for corn and one-fourth for beans."

From Mr. Joseph R. Taylor, Taylor Village, Westmoreland Co., N. B.

"Q. Beans: Were the pods formed, filled or ripened?—A. About one-half of the beans were ripe, the rest well filled.

Average height of plants? Five feet six inches; some of the stalks measured as high as seven feet.

Yield per acre?—Of corn and beans, 16 tons 130 lbs.; of which, estimate about two-thirds for corn and about one-third for beans."

In this case the sunflowers were almost a total failure on account of the storm.

From Mr. Percy G. Mills, Rockville, King's Co., N. B.

"Q. Beans: Were the pods formed, filled or ripened?—A. The lower ones were ripened.

Average height of plants? Three feet.

Yield per acre?—Of sunflower heads, four tons; of corn and beans, fifteen tons; of which, estimate, ten tons for corn and five tons for beans."

From Mr. F. G. Goodenough, Robinson, Compton Co., Que.

"Q. Beans: Were the pods formed, filled or ripened?—A. Some were ripe.

Average height of plants? About three feet.

Yield per acre:—Of sunflower heads?—four or five tons. Of corn and beans? About twelve tons; of which, estimate eight tons for corn, and four tons for beans.

General Remarks:—I think the beans are a fine thing. I will plant them with all my corn next year, if I can get them."

From Mr. Fred. Burns, Island Brook P. O., Compton Co., Que.

"Q. Beans: Were the pods formed, filled or ripened?—A. Well filled and some of them ripe.

Average height of plants? Four feet.

Yield per acre:—Of sunflower heads?—seven tons. Of corn and beans?—twenty-two tons; of which, estimate sixteen tons for corn, and six tons for beans."

From Mr. Cecil A. Barton, Frelighsburgh, Missisquoi Co., Que.

"Q. Beans: Were the pods formed, filled or ripened?—A. Ripened.

Average height of plants? Four feet.

Yield per acre:—Of sunflower heads?—About six tons. Of corn and beans?—About twelve tons; of which, estimate eleven tons for corn, and one for beans.

General remarks:—I found some beans six feet high, and containing 40 pods. The beans were ripe, and a good many of the stalks of them dry when harvested. For that reason, they did not weigh as they would have done had they been cut earlier. I had one sunflower head, 13 inches in diameter, which contained one quart of seed when shelled. I prefer one large head of sunflower to many little ones, as the seeds in the small ones are seldom well filled, and they are very much harder to harvest."

Very much valuable information on several aspects of the growing and cultivating of corn, horse beans and sunflowers, has been gained from the full reports which were sent in by the different farmers who gave the mixture a trial. From that source and the results of our own experience, I offer the following recommendations for the growing of this mixture for the coming year:—

The horse beans and sunflowers can be obtained from almost any of the dealers in seeds. It is not considered necessary or desirable that seeds should be furnished by the Experimental Farm, after information is available on the desirable methods of cultivation, and when they can be obtained from the seed merchants.

Soil.—If a field with a drained, warm, loamy soil be convenient to the silo, and can be used,it should be selected in preference to a heavy clay or wet soil for Indian corn. The horse beans do well in clay soils. In all cases the land will be the better for receiving a liberal dressing of manure. It should be ploughed in the spring, and be harrowed to a state of fine tilth before the seeds are planted.

Time to plant.—The time at which Indian corn for fodder may be planted with the best results, in most districts, is during the last ten days of May, or late enough in the season to escape frosts at night, and early enough to give the plants the advantage of as long a season for growing as is practicable. The horse beans and sunflowers are less liable to injury from frost than Indian corn.

Throughout the province of Ontario and the western portion of the province of Quebec, the horse beans may be planted with advantage from two to three weeks later than the Indian corn.

The sunflowers should be planted as early in the spring as is practicable,—otherwise the heads may not ripen in time to be put into the silo.

Proportion.—The mixture should contain about 10 tons of Indian corn fodder, to about $2\frac{1}{2}$ or 3 tons of horse beans and about 1 or $1\frac{1}{2}$ tons of sunflower heads. To obtain it in these proportions, it should be grown at the rate of one quarter of an acre of sunflowers, and half an acre of horse beans, to every acre of Indian corn.

How to plant.—Throughout the Maritime Provinces and in the eastern part of the province of Quebec, the Indian corn and horse beans may be mixed together and planted in rows 3 feet apart, with from 2 to 4 grains per lineal foot in every row. Elsewhere a larger crop of bean plants, not too ripe and dry for the silo, may be ensured by planting them separate from the Indian corn.

The Indian corn may be planted in rows 3 feet apart, with from 2 to 3 grains per lineal foot in every row. A horse power corn planter or seed-drill may be used for that purpose. Or it may be planted in hills 3 feet apart both ways, with from 4 to 6 grains in every hill. A horse power or hand corn-planter may be used. If neither of these implements and no other suitable planter be available, furrows 3 inches deep may be ploughed 3 feet apart. The seeds may be put in them and covered, after which the field should be rolled.

The horse beans may be planted in rows 3 feet apart, with from 3 to 6 grains per lineal foot in every row. The same machinery or method may be used as for the sowing or planting of the Indian corn.

The sunflower seeds are to be planted by themselves, in rows 3 feet apart. Not more than one plant per lineal foot in the rows should be left to grow. If they come up thicker, they should be thinned out to one plant for every 12 or 18 inches in the rows.

REPORT OF THE HORTICULTURIST.

(JOHN CRAIG.)

To WM. SAUNDERS, Esq.,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit a report of some of the work carried on in the Horticultural Department of the Experimental Farm for the year 1893.

The fruit year as a whole was characterized by a very light crop in the fruit-growing sections of the provinces of Quebec and Ontario. The excessive drought and unusual amount of summer heat prevailing in Ontario between June first and September first, hastened the period of maturity of autumn and winter fruits, and this, together with the presence of apple insects in unusual numbers, caused the fruit to drop from the trees at an earlier period than usual.

The price of autumn and early winter apples in Britain did not rise in proportion to the shortage of the American crop, owing to the excessively large yield of apples in Great Britain which, coming on the London market in competition with the earlier shipments of Canadian apples, had the effect of keeping the price quite low.

At this date the English product, according to reports received, is exhausted, and it would appear that an excellent market for Canadian apples will be available during the remainder of the season.

In Nova Scotia a moderate crop of Gravensteins and Kings, and other standard apples, was harvested and excellent prices obtained.

Increased interest is noticed in the work of spraying for the prevention of fungous diseases and noxious insects. While in every instance spraying for the prevention of fungous diseases, has not rewarded the efforts of the experimenters with complete success, yet there has generally been some particular cause why better results were not obtained, and indeed it is not always wise to quote individual experiments which may have been influenced by local circumstances that do not generally prevail, and so are not applicable to ordinary conditions.

A great variety of spraying pumps are now manufactured and offered for sale in the Dominion. The principal drawback in connection with these implements is that many of them are manufactured with the idea of giving a cheap article to the public. The parts are not sufficiently well constructed to bear the strain of continued use during the spraying season, and consequently break down. This frequent stopping for repairs is one of the most annoying incidents connected with the operation of spraying, and often has the affect of discouraging the fruit-grower to such an extent as to prevent his carrying on the work effectually.

In the report of Mr. Tweddle, which is referred to in the text, special mention is made of this defect in connection with the machine he used.

LARGE FRUITS ON THE FARM.

The standard orchard has, on the whole, made satisfactory progress during the year. Very few varieties which went into winter in good condition were found to be injured in the spring, although the season was very severe.

None of the Russian apples suffered injury from the winter, but, as noted in the article on "Blight," large numbers have been severely attacked by this disease.

This is also true of a few varieties of American origin, notably "Wealthy" and "Wagener."

A considerable number of varieties of Russian apples blossomed, and bore fruit this season, but it was impossible to secure the specimens at maturity owing to the large number of visitors and the numerous small boys frequenting the orchard on Saturday and Sunday of each week. The orchard has since been inclosed by a barbed wire fence which will, it is hoped, obviate this difficulty another year.

The crop of cherries was light this year. A few trees blossomed but did not set fruit.

Nearly all the varieties of American plums blossomed and fruited abundantly, but none of the foreign sorts bore any fruit. Special mention should be made of "De Soto," "Weaver," and "Wyant." The two former having fruited very heavily for three years in succession. "Weaver" was so heavily laden that it was found necessary to remove at least one-half of the fruit, in order to prevent the branches from being broken by the weight of the crop.

Vegetables and Tobacco.

Experiments other than those contained in the report have been carried on with vegetables, including fertilizer tests, methods of cultivation, and trial of new varieties. As is well known the results of fertilizer tests, are only reliable after being carried on for a series of years, and for this reason no report is made for the present.

At the request of the Honourable the Minister of Agriculture, some experiments in the cultivation of tobacco were begun at the farm and the results will be found in the body of the report. Arrangements have been made with a tobacco manufacturer in Montreal, whereby samples of the different varieties tested at the farm, will be made up in the form of the article for which they seem best fitted, and a report will be afterwards made upon their relative excellence.

World's Fair.

It was my privilege, by permission of the Honourable the Minister of Agriculture, to visit the World's Columbian Exposition at Chicago. There, in October, I had the opportunity of seeing the display of samples of the standard fruits of America, and as much time as possible was given to studying the same varieties of fruit grown under different climatic conditions, as well as other interesting questions. New fruits and new horticultural implements were also investigated with much advantage.

The display from Canada, especially from the province of Ontario, was excellent, both from an educational and from an advertising and commercial standpoint.

A great deal of credit is due to the Dominion and Provincial superintendents for the effective manner in which the horticultural resources of the Dominion were brought before the public. In this connection it may be stated that displays of fresh vegetables from the Central Experimental Farm were sent forward at intervals during the summer season. This exhibit was supplemented in the autumn by a consignment of 133 varieties of grapes which arrived in Chicago in very good condition and made an instructive and interesting exhibit, showing as it did the possibilities of this northern latitude in maturing fruit which requires as much summer heat as does the grape. This collection received a diploma from the committee on awards.

Prior to this collections of the fruit of 1892, including grapes, currants, raspberries and goose-berries were put up with preservative liquids in glass jars. These were forwarded in April, 1893, and materially assisted in keeping up the attractions of the exhibit, before the fresh fruits appeared.

Meetings Attended.

I attended officially during the year the annual meetings of the Ontario and of the Nova Scotia Fruit Growers' Associations, also the autumn exhibitions at Montreal and Sherbrooke, P.Q.

Acknowledgments.

I beg gratefully to acknowledge the following donations :—

Mr. John Pitcairn, Point Fortune, Que.—Scions of Pitcairn apples.

J. M. Waters, Esq., Fernhill, Ont.—Seedling raspberry and rose plants.

W. M. Jones, Esq., Gartmore, Man.—Cuttings of native currant and gooseberry.

Mrs. S. Foster, Knowlton, Que.—Two trees each of Hardy and Davis's seedling apples.

Charles E. Brown, Esq.. Yarmouth, N.S.—Apple scions.

Mr. R. W. Starr, Wolfville, N.S.—Apple and pear scions.

Mr. T. H. Race, Mitchell, Ont.—Scions of Oliver seedling.

Mr. A. Reeve, Highland Creek, Ont.—Gooseberry plants.

Mr. W. C. Reid, Belleville, Ont.—Apple and pear trees.

Mr. L. S. Gamache, Cap St. Ignace, Que.—Two trees of Montmagny beauty plum.

Mr. Lachlan Gibb, Montreal, Que.—Roots of Helianthus.

Mr. Auguste Dupuis, Village des Aulnaies, Que.—Horse chestnut seedlings, seed of *Larix Siberica.*

Mr. R. B. Whyte, Ottawa, Ont.—Seedling raspberries.

Mr. Robert Snelling, New Edinburgh, Ottawa.—One Snelling plum tree.

W. M. Pattison, Esq., Clarenceville, Que.—Grape cuttings.

Mr. W. H. Murphy, Ottawa.—Scions of Calumet apple.

I am much indebted to a number of Canadian enthusiasts in horticulture for information of various kinds, embodied in my report and to Mr. Wm. Taylor, foreman in the Horticultural Department, for the zeal and faithfulness with which he carried out the experiments committed to his care.

I have the honour to be, Sir,

Your obedient servant,

JOHN CRAIG,

Horticulturist.

December 15th, 1893.

PEAR AND APPLE BLIGHT.

The disease variously known as "Apple blight," "Pear blight," "Twig blight" and "Fire blight" has wrought a serious amount of injury to trees in the Ottawa Valley during the past season.

The presence of this disease has been noticed in America for 100 years past; one of the first observers being W. Denning, of Massachusetts, who published an article on the "Decay of apple trees' which appeared in the Transactions of the Society for the Promotion of Agriculture, for 1794. In this article he describes the disease as attacking pears and quinces, and thinks that it was caused by a borer in the trunks of the trees. Later we find mention of it in the writings of that pioneer in fruit culture, Wm. Cox, in his work entitled, "The Cultivation of Fruit Trees," written in 1817. Here it is called "Fire Blight," and is minutely described. He says: "I have in twenty years lost upwards of fifty trees in the fulness of vigour; sometimes in the most open and airy situations, and in every kind of soil."

In horticultural writings numerous references can be found with regard to this disease, without absolutely divining or assigning the cause of it up to 1868, when Dr. Hull, of Illinois, first attributed the disease to fungi.

In 1877 the presence of bacteria in affected limbs was discovered by Prof. T. J. Burrill, and in 1880 Prof. Burrill published the first authoritative account of the bacterial origin of this disease, and cited in proof of his observations a large number of experiments in transmitting the disease in various ways from one tree to another by inoculation. A pertinent question at this time was whether bacteria themselves caused the death of the affected portion, or whether these followed as a natural consequence in the track of the life destroyer.

The experiments of Prof. Burrill went largely to show that the bacteria themselves were the actual cause of death, and this point was satisfactorily demonstrated by Prof. Arthur, then of the New York Experiment Station, in 1886, who proved by careful experiments that the disease could only be transmitted by using the juices of branches which contained the characteristic bacteria. In support of this position Prof. Arthur makes the following statements:—

A. "Bacteria are found in great abundance in actively blighting tissues, so as to be demonstrable to the naked eye, and occur in less abundance in proportion as the disease is less active."

B. "The disease may be introduced into healthy tissues by inoculation with germs from diseased tissues."

C. "It is communicated with equal certainty when the germs are separated from all accompanying juices of the diseased tissue, by a series of fractional cultures.

D. "*Per contra*, it is not communicated by the juices of the disease after the germs are removed by filtration.

E. "Germs connected with the disease constitute a single species, which is essential to successful inoculation.

F. "*Per contra*, the numerous species of earth, air, and water are found to a noticeable extent in connection with the disease, and cannot be made to originate it by inoculation or otherwise."

Prof. Arthur further states as the result of his investigations that "A constant ratio is found between the percentage of water in the branches of the several kinds of pomaceous fruits, corresponding to some extent with their liability to blight. The popular opinion that the more rapid growth of the shoots, the more succulent their tissues, and therefore the more liable to blight, is thus confirmed by trial."

The bacteria may keep alive in branches cut from the tree, and remaining in water or moist ground till the following season, and they may also be cultivated in solutions of garden soil, indicating the desirability of promptly destroying all blighted limbs.

With a view of obtaining information with regard to the spread and extent of this disease in the Dominion, a circular was sent to the leading fruit growers in the various provinces. The information obtained from these replies is contained in the tables annexed.

The following tabular statements were arranged with a view of showing the distribution of the disease principally in the provinces of Ontario and Quebec, and to bring out the opinions of practical growers with regard to those methods of cultivation which seem to favour its appearance. It is plainly indicated that without a systematic and very lengthy course of experiments, it is impossible to arrive at satisfactory conclusions regarding any line of remedial treatment; varying conditions of soil and environment lead to results at one point, which are contradicted by the experience of a grower in another section. It is interesting to note that of the replies from Ontario, while 44 per cent had observed no difference in the relative prevalence of "blight" on cultivated ground, and in orchards in sod, 38 per cent were in favour of growing in sod and 17 per cent in favour of giving high cultivation.

There seems to be no doubt that any system of cultivation conducive to rapid succulent growth which is not well ripened in the autumn, furnishes a favourable condition for the development and spread of the disease. Prof. Arthur has clearly demonstrated the truth of this statement.

In Quebec blight appeared during the year, in several of the fruit growing sections, notably in the Counties of Shefford, Argenteuil and Rouville. The soil in the portions most affected, is of a loamy or gravelly nature and frequently strongly impregnated with limestone. As pears are not grown to any extent outside of the Island of Montreal, the disease has principally been restricted to apples. Russian pears at Abbotsford 10 years planted, were very much injured this season. These have been grown in sod since planting.

TABLE I.—PEAR AND APPLE

TABULATED Information gathered from

County.	Observer.	Appearance Previous to 1893.	Character of Injury.	Injury During 1893.
Brant	J. R. Howell	1888	Severe	None.
do	David Greig	1887		do
Essex	N. J. Clinton	1875-76-88	Severe on pear trees	do
do	W. W. Hilborn	None		do
Frontenac	D. Nicol	1889	On apples	
Grey	R. Trotter		Slight on apples and pears.	do
Huron	Alex. McD. Allen	For many years more or less.	Not destructive on apples and pears.	Slight
Halton	Geo. E. Fisher	Occasionally	On pears ; branches killed.	Severe on apple.
Hastings	W. H. Dempsey	For several years in June.	On pears	None
do	W. C. Reid			
Lanark	W. B. Munro	1892	Apples slightly	Slight
do	John Hart	1878	Apples severely	Considerable
Lambton	T. C. Wheatly	Quite frequently	Severe on crabs	None
Leeds	W. G. Kerr	1892	Many apple trees killed	Considerable
Norfolk	J. McMichael	During the past 20 years.	Twigs of apples ; branches of pears.	Very slight in June.
Oxford	S. Hunter	For 25 years past	Pears	Very slight.
Perth	T. H. Race	1892	On young shoots of apple and pear.	Considerable on apple.
do	J. D. Stewart		do do	Slight
Prince Edward	J. Wellington Boulter.	1888-89	Slight injury on twigs	do
Renfrew	W. R. White	1892		Slight on apples.
do	A. A. Wright.	For several years past	Severe on apples	Very severe
Simcoe	G. C. Caston	Slightly		None
do	J. P. Cockburn.	None		do
Toronto	Stone & Wellington	Slight	On pears	
do	D. W. Beadle			
Victoria	Thos. Beall	Slight in past years.	On pears	Slight
Wentworth	E. D. Smith	25 years ago		None
Welland	E. Morden	1889	On pears and apple twigs.	
do	Stone & Wellington	25 years	On pears	Slight
Middlesex	B. Gott	For many years past in varying degree.		None

BLIGHT IN ONTARIO.

Fruit Growers throughout the Province.

Varieties of Pears affected.	Varieties of Apples affected.	Does High Cultivation Favour Blight?	Remarks.
Clapp's, Flemish Beauty.		Evidence conflicting	Sometimes prevented by cutting off affected portion.
Clapp's, Bartlett	Cayuga R. Streak	Trees in sod free from blight.	Good results obtained by washing with 1 peck stone lime, 10 lbs. sulphur, 2 oz. crude carbolic acid, mixed with water and applied as a paint.
Bartlett, Flemish Beauty.		No difference noted	Injury most common on south side of tree.
	Red Astrachan, Transcendent.		No difference noticed.
Louise Bonne, Duchess.			Ground cultivated; no difference noticed.
Clapp's, Osband's Summer, Bartlett.			Finds regular cultivation and manuring productive of good results. Occasional cultivation with heavy manuring injurious.
Vicar of Winkfield, Duchess, Bartlett.	Nearly all varieties; Cranberry Pippin & Golden Russet.	No difference noted	Has had good results from splitting the bark, which hardens after the tree is attacked.
Clapp's	Greening	Rich ground developed more blight than poorer land.	Gives an instance of trees in rich ground being attacked, while those in sod escaped.
	Early varieties		Cutting off affected portions apparently checked spread of disease.
	Fameuse Alexander, Yellow Transparent.	Apparently it does	
Bartlett, B. d'Anjou.	Siberian crabs	Alluvial soils favour blight.	Does not believe in growing pears in sod Affected branches should be removed.
	Seedling trees	Worst in old orchards seeded down.	Recommends cutting off diseased portions.
Clapp's, Flemish and most popular varieties.	Greening, Fall Pippin.	Worst on cultivated ground.	Recommends cutting off diseased branches and mulching trees with coal ashes; uses no barnyard manure.
Rapid-growing varieties.		Yes; trees in sod are less injured by the disease.	
	Nursery stock growing rapidly.	No difference	Reports good results from the use of Bordeaux mixture.
Clapp's, Ananas d'été	Early varieties; Early harvest; Snow.	Less blight noticed on trees in sod.	
			Believes in seeding down the pear orchard after three or four years and manuring annually.
	On crabs and early varieties.	Has not noticed	
	Yellow Transparent, Wealthy.	No difference noted	Recommends cutting off affected branches.
Flemish Beauty		Has made no observations.	
			Generally worst on low, damp, cultivated ground.
			See letter.
Clapp's, Flemish			Branches cut off and destroyed.
Nearly all varieties of early pears.		Probably	
Bartlett, Flemish Beauty.		No difference noticed	Clean cultivation given and advocated.
All varieties, more or less.	Russian apples	Yes, on moist soils	Believes in growing on dry, airy situations and fertilizing with wood ashes.
All varieties			Thinks neglected trees are most liable.

PEAR AND APPLE

TABULATED Information gathered from

County.	Observer.	Appearance previous to 1893.	Character of Injury.	Injury during 1893.
Brome..........	Sec. Fruit Growers' Association.	None..............	....	....
Hochelaga......	R. Brodie	For 12 or 13 years...	On apples during July...	Slight this year......
Huntingdon	W. H. Robinson..	....	Slight.................	On apples in June...
Kamouraska....	J. C. Chapais.....	None............	....	....
Huntingdon	Jas. Fulton.	Slight	On pears...............	....
Lotbinière......	H. G. Joly de Lotbinière.	None.	....	....
Missisquoi......	David Westover ..	....	Slight twig blight.......	....
Montreal	E. B. Meyer... ..	1892..............	Twig blight severe in 1892	Slight ....
do	Wm. Evans.	....	....	....
Argenteuil......	R. Hamilton......	20 years or more	Twigs and branches on apples.	Apples much injured.
....	....	1893 only..........	Twigs of apples, branches of pears.	Severe on pears......
Rouville.... ..	J. M. Fisk	1893 only..........	do do ...	do ......
Stanstead.......	J. Fraser.........	For several years....	Twigs of apples.........	Slight ....
Shefford........	Wm. Gill.........	....	....	Very severe on apples.

BLIGHT IN QUEBEC.

Fruit Growers throughout the Province.

Varieties of Pears affected.	Varieties of Apples affected.	Does High Cultivation favour Blight?	Remarks.
....	....	....	Blight not noticed.
....	Alexander, Bethel	Has made no observation	Top-dresses with manure and wood ashes.
....	Crab apples............	This point not noticed...	
....	....	....	Blight unknown in Kamouraska.
....	....	....	Believes firmly in the value of cultivation and regular manuring.
....	....	....	Blight unknown in this county.
....	Early varieties..........	This point not noticed...	
Flemish Beauty.	Waxen crab, Transcendent, Ben Davis, Alexander.	....	Ground highly cultivated.
....	....	....	
....	Transcendent, Alexander, Fameuse and Russians, Switzer.	Evidence not conclusive.	Dry, airy positions seem to be less affected than moist, sheltered ones.
....	....	....	
Russian varieties	Alexander, St. Lawrence, Arabka.	Much worse on rich cultivated ground.	Orchards with western aspects are affected more than those with southern aspects.
....	Duchess and peach	More blight on uncultivated ground.	
....	All varieties...........	....	

The following sketch of the history of the disease in Ontario, by Dr. Beadle, will be read with much interest:—

"In the early days of fruit-growing in the Niagara District, we had no pear-tree blight, nor apple-tree blight. * * * * * * With the advent of what people termed grafted fruit, came after a few years 'blight' on the pear tree, and not until several years after it had become a serious plague of the pear, did it affect the apple tree, to any appreciable extent. The first pear trees that bore fruit in my father's garden were of the Summer Bonchretien variety. These did not blight for some time after they began to bear, and I am unable to give you the exact date of its first appearance, but by the year 1840 it had begun to appear in those, and other pear trees in the garden. In 1847, A. J. Downing complained that the 'blight' of the pear was a serious drawback to the extensive cultivation of the tree. In 1845 it was severe in the west, that is as far west as Indiana, and apparently was but little known in that region before that summer. About 1827 to 30 it was said to have been very destructive to pear trees at Schenectady, N.Y., but no mention was made of any injury to apple trees from this cause; it then disappeared for some twenty years. There was a similar apparent periodicity in the Niagara district. My father having learned that some had applied blacksmith's cinders with beneficial results, tried them upon his pear trees, digging them into the ground over the roots as far as they probably extended. After this some ten years elapsed without any blight in his trees, but it broke out again, and I think there has never been as long a period of exemption since.

"I have no data that enable me to say when it appeared in the apple trees. Its first serious work on apple trees was upon the crab-apple trees, such as Red and Yellow Siberian, Montreal Beauty, &c., not unfrequently killing the whole tree. Its effects on other apple trees are confined for the most part, if not wholly, to the young shoots of the summer's growth. I cannot now recall one instance of even a whole branch having been killed by it, and am confident that I have never known an apple tree, other than the crabs, to be ruined by the 'blight.' As to the time when the blight appears, there is no time after the beginning of June when it has not appeared, but usually its presence is more abundantly manifested from the middle of July to the end of August.

"With regard to varieties of pears, the Duchess d'Angouleme, Rutter and Seckel are the least subject to the 'blight' of the varieties with which I am acquainted. Of the rest, in some seasons one would seem to be the most subject to the 'blight,' in the next year some other variety would take the lead.

"Fifth inquiry, trees in sod *versus* trees in cultivated ground. No opportunity has been presented to me of making such a comparison. In 1885 I copied into the Can. Horticulturist, vol. viii., an editorial from the Philadelphia *Record* giving an account of two orchards adjoining each other, and in soil and varieties alike, situate at Newfield, New Jersey, the one cultivated to garden crops and liberally manured, the other kept in grass, ploughed occasionally and re-seeded. The first was at that time nearly destroyed by blight, the second as sound as when first set out, though the trees were only about half the size of the cultivated, had never borne as well, nor equalled them in appearance. Query:—Are the bacteria the cause, or is the diseased tree or branch favourable to the multiplication?

"Very truly yours,

"D. W. BEADLE,

"Toronto."

BLIGHT AT THE EXPERIMENTAL FARM.

The experimental pear and apple orchard are on sandy loam underlaid with a stiff gravelly subsoil much too near the surface for the ideal orchard soil.

The ground has been cultivated annually, since planting the trees five years ago, and has been manured on alternate years since that time. Blight appeared about the middle of June, 1892, in the pear orchard; although every blighted branch (or in bad cases the whole tree) was removed without delay, it continued to spread during the entire growing period and late into autumn.

None of the Russian varieties escaped injury, some twenty-five being killed to the ground. During the third week of June the disease appeared simultaneously in a block of Wealthy trees planted at some distance, and in the Russian apple orchard, which is contiguous. The injury in both cases amounted to the loss of branches, in some cases a few, in others sufficient to injure the symmetry of the tree.

In 1893 it appeared earlier than in the preceding season and simultaneously on Wealthy, the Russian apples, and pears. The injury was much more severe. One tree of Wealthy was killed, and many specimens of Russian varieties cut down to mere stumps. The injury to the Russian pears was of the same character as the year previous and quite as severe. "Flemish Beauty" and "Beurre d'Anjou" in the same orchard suffered only to a slight extent.

As soon as a branch was removed the remaining stump was painted with linseed oil. Although in every case the cutting was made 15 to 18 inches below any discoloured bark, yet in fully 50 per cent of the cases the disease appeared subsequently at a lower point in the affected branch. This feature in the course of the malady was specially noticeable in the case of the pears, as the blighting of both Russian apples and pears was so general. A report on the relative immunity of the different varieties is withheld till the experience of another season is added.

This brief review of the subject has been undertaken with the object of bringing together as much experience as it was possible to collect from the practical grower, and if feasible to make such deductions as would lead to useful practices in controlling the disease.

While the majority of the replies point to the fact that trees grown in sod have been injured less on the whole than others which were cultivated, it is not proper to conclude that this therefore is the most approved method of growing apples or pears. The nature and character of the soil should, in all cases be duly studied and a treatment given calculated to produce a fair amount of well ripened wood each year. On moist rich alluvial soil it is quite probable that clean cultivation in the long run, will not give as good results as growing the trees in sod, which should receive annually a dressing with a fertilizer in which potash and phosphoric acid form the greater proportion. On the other hand it is idle to suppose that apple or pear trees can be successfully grown on light soils without systematic cultivation and annual enrichment of the soil. Situations having subsoils which are cold and wet should be avoided. Where such conditions prevail, tile-training will mitigate to some extent the injurious effect of such unfavourable conditions.

NEW FRUITS.

Grapes.

The following new varieties fruited this season:—

Alexander's Winter.—Received spring of 1891 from S. D. Alexander, Bellefontaine, Ohio. Vine a fair grower, with foliage characteristic of the Labrusca type.

Bunch loose, straggling, berry large, round and very slightly oval; very dark amber in colour; skin thick; fairly tender; very little juice; pulp, meaty acid. Seeds large; quality only fair. Ripens with Salem. Not likely to be valuable here.

BRILLIANT.—Mr. T. V. Munson, Denison, Texas, produced this variety by pollinating Lindley with Delaware in 1883. The vine is moderately vigorous. Bunch long, shouldered, berry medium size, almost round, colour deep garnet; skin thin, juicy; pulp tender; seeds large, usually two to three; quality good. Berries do not drop easily. The first fruit of this variety did not ripen this season, although claimed to be as early as Delaware by the introducer.

CHASE BROS.—A single vine of a variety received from Chase Bros. & Co., Rochester, N. Y., in 1887, and entered in the vineyard records under the above name has fruited for the past three seasons. The introducers write that "the variety originated with Mr. Jacob Moore, formerly of Brighton, N. Y." They further say "that the fruit is most excellent in quality, but it proved to be a very shy bearer here so much so that we did not feel justified in putting it on the market."

As fruited here the bunch is of medium size shouldered, fairly compact; berry medium size, round; colour rich bright wine, skin fairly thin, juicy, very sweet; pulp tender, melting, seeds medium size, usually two, quality good, ripens with Delaware. Berries drop somewhat after picking. While recommending this variety to growers I would have them bear in mind the experience of the New York introducers.

ECLIPSE.—Originated by John Burr, of Leavenworth, Kansas, and introduced by Stayman & Black, nurserymen of the same place.

Vine a weak grower; bunch medium to small, shouldered; berry large, round, vivid green in colour; skin fairly thick, small amount of juice; pulp tender, brisk acid, fair quality. Berries hold on well. Ripens a week later than Concord. Too late for this locality.

FARRELL.—Origin the same as the last.

Vine a moderate grower. Bunch large, tapering, shouldered; berry medium to small, round, yellowish white; skin thin, pulp rather tough; juice vinous sweet. Seeds small, numerous. Too late for this locality taking this season as a criterion.

HERMANN JAEGER.—Originator, T. V. Munson, Denison, Texas. Produced by pollinating *Vitus Lincecumii*, the Post Oak grape of Texas—with Herbemont—an old Texas variety.

This did not fruit in sufficient quantity to give a correct impression of the size and form of the bunch which is said to be large and shouldered. Berry was small, round, black with purplish bloom; firmly attached to peduncle; juice and pulp sprightly acid. Seeds small. Not ripe when picked October 10th. Later than Concord. Not promising for this vicinity.

IDEAL.—A seedling produced by John Burr, and introduced by Stayman & Black, of Leavenworth, Kansas.

Bunch medium size; berry large, round, purplish amber; skin thick; juice abundant; vinous sweet; pulp tender. Seeds large and numerous; quality fair to good, ripens with Concord.

ONEIDA.—Said to be a seedling of Merrimack which it does not resemble in a single characteristic. Vine a short jointed, weak grower. Bunch medium size, slightly shouldered; berry small oval, amber coloured; skin thick, tough; juice rich and sweet; pulp meaty, and acid, seeds large. This variety keeps well, which seems to be its only point of merit.

PARAGON.—A seedling produced by John Burr and introduced by Stayman & Black. Bunch medium size, cylindrical, compact. Berry medium size, round, black with purplish bloom. Skin thin; very juicy with a tender dissolving pulp; seeds small; quality medium. Berry does not drop readily. Ripe, 5th September. Keeps till December. Berries resemble Early Victor quite closely.

STANDARD.—Origin the same as the last. Bunch and berry medium size, black. Skin thin: small amount of juice; pulp tough and acid. Ripens a little in advance of Concord. Loses flavour rapidly. Not promising.

CAMPBELL.—Produced from seed of Triumph by T. V. Munson, Denison, Texas. The first fruiting of this variety has given a small compact bunch. Berry medium to small, round; skin thin, translucent; very juicy; pulp melting. Seeds small; quality good. Ripens with Concord.

WHITE BEAUTY.—A seedling produced by John Burr and introduced by Stayman & Black, Leavenworth, Kansas. Bunch medium size, compact, shouldered. Berry round, clear white, covered with light lilac bloom. Skin thin, very juicy; pulp moderately tender. Seeds numerous; quite foxy; medium quality. Late.

RASPBERRIES.

Black.

OLDER.—This variety originated with and has been introduced by R. D. McGeehon, Atlantic City, Iowa, from whom plants were received which were set out in the spring of 1892. These bore some fruit the same season and an abundant crop this year. The plant is exceedingly vigorous and roots from the tips very readily.

Berry large, round, deep black, with very large drupes. The seeds are not prominent, and the berries are borne in good sized clusters, very juicy and of good quality. It also has the habit of fruiting heavily on the young wood. This year the first fruit ripened with Hilborn, while it continued bearing till the season of Gregg had closed. (See Figure I). So far this seems to be a profitable variety.

Fig. 1. OLDER.

A number of the newer black caps are being tested, but the above is the only one which so far stands out prominently as a variety worthy of careful trial.

SEEDLING RASPBERRIES.

The seedling raspberries so favourably mentioned by a joint committee of the fruit-growers of Ontario and Quebec, in the annual report for 1890, have been undergoing further trial. Transplanted and subjected to ordinary field culture, some have not sustained their early reputation, while others at first not deemed very promising have done remarkably well.

Fig. 2. SARAH.

One variety not mentioned by the committee in this report for the reason that being very late, it was not at its best during the time of their visit, has since shown so many points of excellence that it has been named and is now being propagated for distribution. It may be described as follows:—

SARAH.—(Record number 4–38.) Produced in London, Ont., by Prof. Saunders, from seed of Shaffer's Colossal. Plant a moderate grower, suckering freely, and pro-

pagating naturally only in this way. The foliage seems to be intermediate between the European raspberry *Rubus Idaeus* and the American *Rubus Strigosus.* The canes have been affected to some extent by anthracnose, but not more than Cuthbert or Marlboro growing along side. Fruit large, round ; drupes large, deep garnet, firm, very juicy, pleasantly acid and exceptionally rich. See Fig. 2. A few ripe berries were found last year, and this year, at the time of the first picking of Cuthbert, but the main crop did not ripen till the season of Cuthbert was over, the last picking taking place each year from the 8th to 12th August.

A striking characteristic of this variety is its habit of ripening the fruit in consecutive order and much regularity, beginning with the terminal clusters of each branch. Of course this is in a measure true of all red raspberries, but none that I know of carry the peculiarity to the same extent.

SEEDLING APPLES.

A large number of samples of apples, mainly seedling varieties, have been received during the past three years. The two following seem to merit propagation and careful trial:—

DERY.—(*Syns, Alexis Baldwin, Dery's seedling, Pomme de Fer.*) Received from F. L. Dery, of Mont St. Hilaire, Quebec, October 7th, 1891. The original tree was examined October 23rd, 1892, and samples were again received from Mr. Dery this autumn. Mr. Dery says this tree was raised from the seed of American Baldwin, planted by his father about seventy years ago. Since fruiting age it has borne moderate annual crops. It is still fairly healthy and with good care should live for many years.

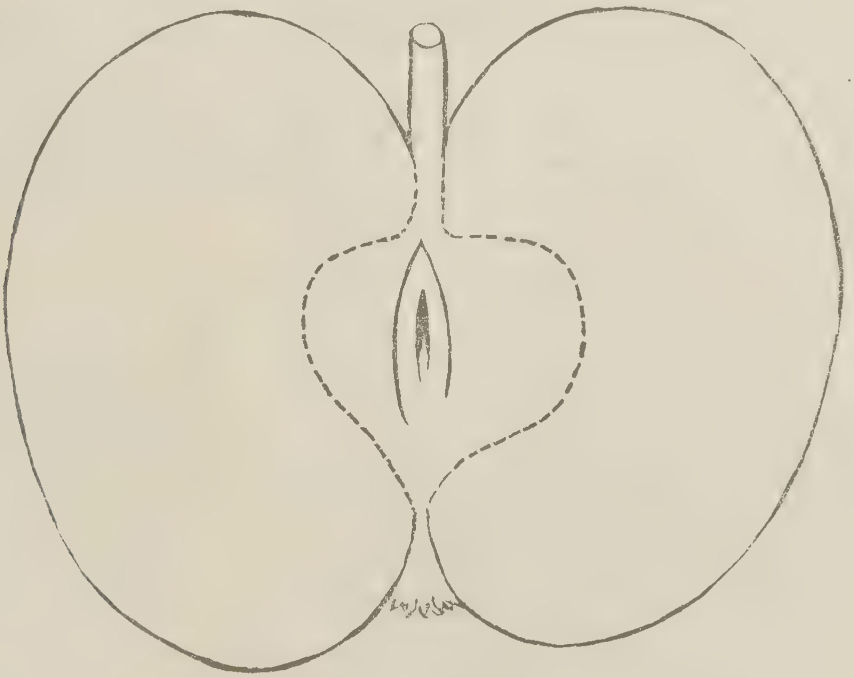


Fig. 3.—DERY.

Fruit medium to large, oblate, $3\frac{1}{4}$ x $2\frac{1}{2}$ inches, slightly ribbed. Skin green and almost entirely covered with dark red, which is specked with numerous white dots, resembling Canada Baldwin, closely in this respect. Stem short usually about half an inch. Cavity moderately shallow, regular and slightly russetted. Basin, small wrinkled. Flesh, greenish white, firm, lacking juiciness, sub-acid, quality good. See Fig. 3. The best condition is reached during March and April. The apple known and cultivated in the Eastern Townships as "Pomme de Fer" resembles the above closely and is evidently from the same stock.

CALUMET.—Received from Mr. W. H. Murphy, of Ottawa, who described the tree as growing on his farm on Calumet Island supposed to be of seedling origin, apparently about thirty years of age.

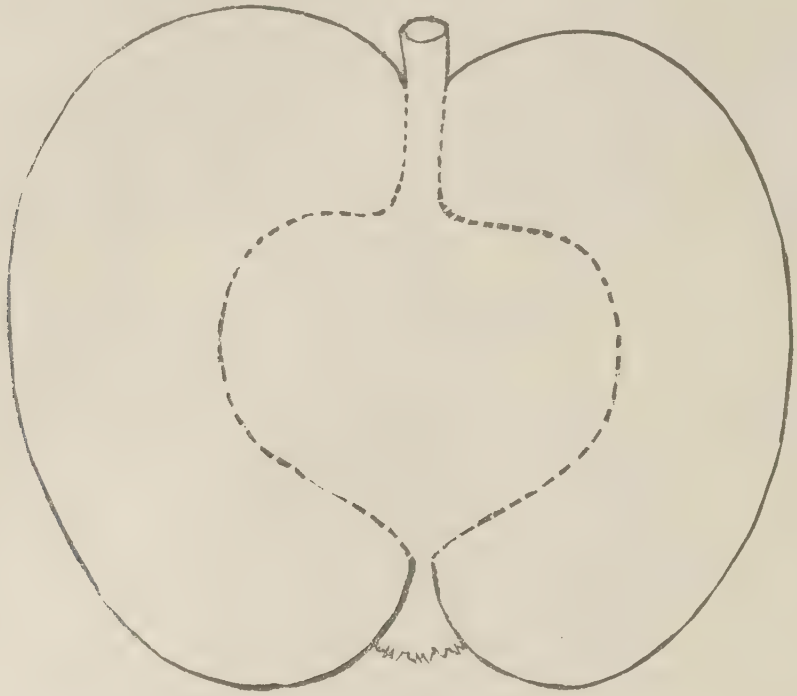


Fig. 4.—CALUMET.

Fruit medium to large, round, or approaching oblong, very regular. Skin green, when fully ripe, yellow, partly covered with streaks and splashes of light red. Stem short; cavity almost wanting: calyx open; basin small and shallow; flesh firm, white, very juicy, sub-acid, good. See Fig. 4.

Mr. Murphy says it keeps through the winter with ordinary care. Specimens kept in my office were in good eating condition on the first of last June. The skin of this variety is not of the kind that is usually affected by the "spot" disease *Fusicladium.*

SPRAYING EXPERIMENTS.

An extended series of spraying experiments were undertaken and carefully carried out by Mr. Joseph Tweddle, of Stoney Creek, Ont., under my direction. Mr. Tweddle has furnished a report of much interest, on the work of the season, which I wish to acknowledge very gratefully. The season in the Niagara district was an abnormal one in many respects however, and no doubt had an important effect upon the results of the experiments which in many instances were quite contrary to previous experience. Mr. Tweddle reports little protection against codling moth and "apple spot" from the use of Bordeaux mixture or ammoniacal copper carbonate, but says that some few specimens of apples could be found, showing where the disease had attacked the fruit, and apparently had been destroyed by the fungicide, leaving a russetted spot on the affected portion, the remainder of the apple being healthy. Mr. Tweddle is also of the opinion that the "codling moth" developed most and caused most destruction after the spraying season closed, although quite a percentage of the fruit was attacked before spraying was finished. One of the most important features in connection with the work is the relative efficacy of Paris green in combination with Bordeaux mixture, and when applied alone. Mr. Tweddle writing of this says: "It is apparent to me that the poisonous action of Paris green was lessened when used in combination with the Bordeaux mixture, and the effect was plainly visible in the apple and plum orchard, particularly in the plums. Where Paris green was used by itself on these, they were much more free from curculio than when it was applied with Bordeaux mixture." This raises an interesting ques-

tion. My report of 1891 on spraying shows the value of adding Paris green to the solutions of ammoniacal copper, but no exact figures have been gathered showing the effect of adding lime. Exact data will be obtained on this point as soon as possible. With regard to small fruits, Mr. Tweddle says "some encouraging results came from the use of Bordeaux mixture and Paris green for the destruction of the currant worm, and for the prevention of mildew on gooseberries—some of them English varieties. The first brood of the larvæ appeared in myriads on the currant bushes shortly after fruit set. A single application of the above was made soon after the worms were hatched when $\frac{1}{8}$ inch in length, but not all were destroyed. When in two or three days, but before the worms were large enough to devour the foliage rapidly, two more applications were made on the same day, going opposite directions on the rows and completely covering the foliage. This was entirely successful in destroying the first brood, and also the second, for the lime in the Bordeaux mixture stuck the whole thing to the foliage so well that it remained all season, and if any of the second brood were hatched, they immediately received their dose and vanished." He says further: "No mildew or sunscald appeared on the English gooseberries (although none even were left unsprayed as checks on my place), yet both mildew and sunscald affected my neighbour's plantation alongside under similar conditions, where no fungicide was applied." It is hoped that the experience gained as the result of another season's work will clear up some points which at present appear contradictory and unsatisfactory.

EFFECTS OF DILUTE SULPHURIC ACID ON FOLIAGE.

The use of sulphuric acid has been suggested by prominent horticulturists on the grounds that it contains the essential elements of a fungicide, and being prepared by simple dilution would therefore be more easily applied than the copper salts.

Some preliminary experiments were inaugurated this season in order to ascertain the maximum strength at which it could be safely applied to the foliage of various plants.

The information obtained is embodied in the following tabular statement:—

Plants Treated.	Date of Application.	Strength by Weight.				Remarks.
		$\frac{1}{4}$ per cent.	$\frac{1}{2}$ per cent.	1 per cent.	$1\frac{1}{2}$ per cent.	
Grapes	June 5.	Injured				Badly burned and shrivelled.
Plums	do 5.	do	Badly injured.			Injury severe.
Apples	do 5.	do				Burned in spots.
In Greenhouse. Rose foliage, mature.	Mar. 14.	No injury	Injured	Consid'rably injured.	Badly injured.	Injury gradually increased.
In Greenhouse. Rose foliage, young.	do 4.	do	No injury	Slightly injured.	Considerably injured.	Half-grown leaves uninjured.
In Greenhouse. Strawberry	do 4.	do	Slightly injured.		Badly injured.	Young as well as old leaves injured.
In Greenhouse. Geranium	do 4.	do	do			
In Greenhouse. Hibiscus	do 4.	Slight injury.	Injured	Badly injured.	Badly injured.	Scorched in spots.

The injury to the foliage in every case appeared to be due to the concentration of the sulphuric acid by the evaporation of the water used as the dilutent.

The rate of evaporation would of course be largely governed by the humidity of the atmosphere and would be relatively slower under greenhouse conditions than

out of doors. This concentration of the acid into small globules over the surface of the leaf has the effect of scorching a small circular spot wherever the residue is collected. The injury was more severe and more readily detected on the foliage treated out of doors than that in the greenhouse.

Applied to roses at the rate of 1½ per cent by weight, while severely scorching the leaves it had no apparent effect on green and black aphis infesting the plants.

While the above experiment may be looked upon as preliminary, yet the outlook considering the dangerous character of this substance as a spraying material, is not encouraging.

A DISTRICT FRUIT LIST ADAPTED TO THE PROVINCE OF QUEBEC.

There is a peculiar interest and fascination connected with the testing of new varieties of fruits, which often leads orchardists into the serious mistake of planting too many kinds from a commercial standpoint. There is also a lack of knowledge in many portions of the country, new to fruit growing, with regard to the natural characteristics of the leading varieties of fruits, and their probabilities of success under given conditions. This uncertainty of course often leads to unnecessary expenditure of time and money. The following rough subdivision of the province into horticultural districts, with a list of fruits suitable for cultivation in each has been made, with the hope that it will serve as a guide to the inexperienced but intending fruit grower.

It should be remembered, however, that it will often pay better to cultivate a local variety which is well adapted to the soil and climate of the vicinity, than to import a foreign variety on the strength of a reputation built up abroad. On the other hand, certain varieties have been largely grown and exported, and are now looked upon as standards by the shipping trade; where these succeed, it is of much pecuniary advantage to the orchardist to grow them. Unfortunately there are few sections in the province of Quebec where the varieties of apples best known to the export trade can be successfully grown.

By top-grafting on hardy stocks, for which purpose Haas, and some of the hardy Russians are useful, there is no doubt that Northern Spy, Jonathan and Ontario varieties well known to the British markets, could be profitably grown in the counties of Missisquoi, Huntingdon, Beauharnois, and on the Island of Montreal. Other regions in the Valley of the St. Lawrence possess a suitable climate, but are not equally favoured in the matter of soil; the heavy clays being better adapted to raising farm crops than to the growth of fruit trees. But there is no region in this province where a large and varied collection of tree and small fruits, cannot be grown with profit and pleasure to the cultivator.

For arranging the district lists, I take occasion to acknowledge a large amount of valuable data given me by the leading fruit growers of the province.

The allotment of varieties to the different districts, was made on a two fold basis. First, to recommend only those varieties presumably well adapted and sufficiently hardy; and second, to reduce to a minimum the total number of varieties recommended in each class. Following these rules, therefore, where varieties of equal merit came into competition, the one previously inserted was again chosen; those of proved health and vigour being first selected.

It may be noticed that the same apple, Wealthy for example, appears as an autumn variety in one district, and as a winter variety in another. This is an effect produced by the amount of summer heat and the length of the growing season, charactistic of the climate in which it has been grown. In Gaspé, Duchess becomes early winter, while Wealthy sometimes ripens with difficulty, and keeps till late winter under ordinary circumstances.

The grouping of the counties was made principally on the basis of similarity of climatic conditions, and contiguity of position. The list should be looked upon as an elementary guide to amateurs and beginners in fruit growing, and it is hoped that it will form a starting point for a more complete and accurate classification which should be arranged by the Provincial Horticultural Society.

ALPHABETICAL ARRANGEMENT OF COUNTIES WITH DISTRICT NUMBER.

County.	District No.	County.	District No.
Argenteuil	9	Mégantic	4
Arthabaska	4	Missisquoi	1
Bagot	2	Montcalm	8
Beauce	4	Montmagny	6
Beauharnois	1	Montmorency	12
Bellechasse	6	Montreal	10
Berthier	11	Napierville	1
Bonaventure	7	Nicolet	5
Brome	2	Ottawa	8
Chambly	2	Pontiac	8
Champlain	12	Portneuf	12
Charlevoix	12	Quebec	12
Châteauguay	1	Richelieu	5
Chicoutimi	13	Richmond	3
Compton	3	Rimouski	7
Dorchester	6	Rouville	2
Drummond	4	St. Hyacinthe	2
Gaspé	7	St. John	1
Hochelaga	10	St. Maurice	11
Huntingdon	1	Saguenay	13
Iberville	1	Shefford	2
Jacques Cartier	10	Sherbrooke	3
Joliette	11	Soulanges	10
Kamouraska	6	Stanstead	3
Laprairie	10	Temiscouata	7
L'Assomption	9	Terrebonne	9
Laval	10	Two Mountains	9
Lévis	5	Vaudreuil	10
L'Islet	6	Verchères	5
Lotbinière	5	Wolfe	4
Maskinongé	11	Yamaska	5

DISTRICT No. 1.—HUNTINGDON, CHATEAUGUAY, BEAUHARNOIS, MISSISQUOI, IBERVILLE, NAPIERVILLE.

APPLES	Summer—Yellow Transparent, Red Astrachan, Duchess. Autumn—Wealthy, Foundling, Alexander. Winter—Golden Russett, Ben Davis, Scotts' Winter.
PEARS	Flemish Beauty, Beurre d'Anjou, Kurskaya.
PLUMS	Blue—Glass Seedling, Blue Damson. Red—De Soto, Wolf, Weaver.
CHERRIES	Kentish, or Common Red, Early Morello, Späte Amarelle.
GRAPES	White—Lady, Winchell, Moore's Diamond. Red—Moyer, Delaware, Vergennes. Black—Moore's Early, Rogers' 17, Peabody.
RASPBERRIES	White—Golden Queen. Red—Heebner, Marlboro, Cuthbert. Black—Hilborn, Gregg, Shaffer (purple).
GOOSEBERRIES	Houghton, Downing, Pearl, Industry.
CURRANTS	White—White Grape. Red—Red Grape, Versaillaise, Moore's Ruby. Black—Lee's Prolific, Prince of Wales.
BLACKBERRIES	Snyder, Agawam.
STRAWBERRIES	Bubach, Beder Wood, Warfield.

DISTRICT No. 2.—ROUVILLE, CHAMBLY, BAGOT, SHEFFORD, BROME.

APPLES	Summer—Yellow Transparent, Duchess, Summer Arabka. Autumn—St. Lawrence, Wealthy, Fameuse, Antonovka. Winter—Golden Russet, Scott's Winter, Ben Davis, Canada Baldwin.
PEARS	Flemish Beauty, Kurskaya, Bessemianka.
PLUMS	Foreign—Lombard, Glass Seedling, Early Red. Native—De Soto, Wyant, Wolf.
CHERRIES	Early Richmond, Early Morello, Späte Amarelle.
GRAPES	White—Lady, Duchess, Moore's Diamond. Red—Delaware, Moyer, Lindley, Brighton. Black—Moore's Early, Worden, Peabody, Gibb.
RASPBERRIES....	White—Golden Queen. Red—Hansel, Heebner, Cuthbert. Black—Ohio, Gregg, Shaffer (purple).
BLACKBERRIES.	Taylor Prolific, Agawam.
GOOSEBERRIES..	Houghton, Pearl, Industry, Smith's Improved.
CURRANTS	White—White Grape. Red—Fays' Prolific, Victoria. Black—Black Champion.
STRAWBERRIES.	Bubach, Manchester, Warfield, Beder Wood.

DISTRICT No. 3.—STANSTEAD, COMPTON, SHERBROOKE, RICHMOND.

APPLES	Summer—Yellow Transparent, Tetofsky, Duchess. Autumn—Peach, Gideon, St. Lawrence. Winter—Arabka, Wealthy, Ben Davis, Canada Baldwin.
PEARS	Bessemianka, Kurskaya.
PLUMS	Foreign—Blue Damson, Glass seedling. Native—De Soto, Wyant, Rollingston.
CHERRIES........	Early Richmond, Large Montmorency, Early Morello.
GRAPES	White—Lady, Winchell. Red—Moyer, Delware, Vergennes, Lindley. Black—Early Victor, Moore's Early, Worden.
RASPBERRIES ...	White—Golden Queen. Red—Turner, Heebner, Marlboro', Cuthbert. Black—Doolittle, Hilborn, Shaffer (purple).
BLACKBERRIES.	Snyder, Ancient Briton.
GOOSEBERRIES..	Houghton, Pearl, Red Jacket.
CURRANTS........	White—White Grape. Red—Victoria, Versaillaise. Black—Black Champion.
STRAWBERRIES.	Crescent, Bubach, Windsor Chief.

DISTRICT No. 4.—MEGANTIC, WOLFE, ARTHABASKA, BEAUCE, DRUMMOND.

APPLES	Summer—Tetofsky, Red Astrachan. Autumn—Duchess, White Pigeon, Switzer. Winter—Arabka, Scott's Winter, Hibernal.
PEARS	Bessemianka, Sapieganka.
PLUMS	Blue Damson, De Soto.
CHERRIES	Early Morello, Bessarabian, Richmond.
GRAPES	White—Lady. Red—Moyer, Delaware. Black—Hartford, Early Victor, Moore's Early.
RASPBERRIES	White—Caroline. Red—Hansel, Turner, Cuthbert. Black—Hilborn, Mammoth Cluster.
BLACKBERRIES	Snyder, Ancient Briton.
GOOSEBERRIES	Houghton, Pearl, Red Jacket.
CURRANTS	White—White Dutch. Red—Victoria, Red Dutch Black—Lee's Prolific.
STRAWBERRIES	Crescent, Capt. Jack, Manchester, Windsor Chief.

DISTRICT No. 5.—VERCHÈRES, RICHELIEU, YAMASKA, NICOLET, LOTBINIÈRE, LÉVIS.

APPLES	Summer—Tetofsky, Blushed Calville. Autumn—Duchess, White Pigeon, Switzer. Winter—Arabka, Wealthy, Hibernal, Ostrekoff.
PEARS	Bessemianka, Gakovka.
PLUMS	Blue Damson, Rollingston, De Soto.
CHERRIES	Kentish or Native Red, Early Morello, Bessarabian.
GRAPES	White—Lady, Martha. Red—Moyer, Delaware. Black—Florence, Early Victor, Moore's Early.
RASPBERRIES	White—Yellow Antwerp. Red—Heebner, Turner, Cuthbert. Black—Mammoth Cluster, Shaffer (purple.)
BLACKBERRIES	Snyder, Agawam.
GOOSEBERRIES	Pearl, Industry.
CURRANTS	White—White Grape. Red—Victoria, Red Grape. Black—Black Champion.
STRAWBERRIES	Crescent, Capt. Jack, Manchester.

DISTRICT No. 6.—DORCHESTER, BELLECHASSE, MONTMAGNY, KAMOURASKA, L'ISLET.

APPLES	Summer—Yellow Transparent, Red Astrachan, Blushed Calville. Autumn—Duchess, Lubsk Reinette, White Pigeon. Winter—Wealthy, Golden Russet, Switzer, Arabka, Longfield.
PEARS	Flemish Beauty, Bessemianka, Gakovka.
PLUMS	Foreign—Blue Orleans (Damas), Reine Claude, Lombard. Native—Rollingston, Wolf.
CHERRIES.........	Montmorency Ordinaire, Kentish (Cerise de France), Bessarabian, Orel 25.
GRAPES	White—Lady; Red :—Moyer. Black—Florence, Early Victor, Moore's Early, Hartford.
RASPBERRIES ...	White—Framboise Blanche. Red—Antwerp, Heebner, Cuthbert. Black—Mammoth Cluster, Gregg.
BLACKBERRIES .	Snyder, Agawam.
GOOSEBERRIES..	Houghton, Pearl, Industry, "Grossellier de France."
CURRANTS........	White—White Dutch. Red—Victoria, Versaillaise. Black—Black Champion.
STRAWBERRIES .	Alpine, Bubach, Warfield, Windsor Chief.

DISTRICT No. 7—TEMISCOUATA, RIMOUSKI, BONAVENTURE, GASPÉ.

APPLES	Summer—Tetofsky, Whitney, No. 20 (Crab.) Autumn—Duchess, White Pigeon. Charlamoff. Winter—Wealthy, Longfield, Fameuse, Antonovka.
PEARS............	Gakovka, Bessemianka.
PLUMS............	Blue Damson, De Soto, Blue Orleans.
CHERRIES........	Early Morello, Bessarabian, Orel 25.
GRAPES	Black—Florence, Cottage, Early Victor.
RASPBERRIES....	White—Yellow Antwerp. Red—Heebner, Turner, Cuthbert. Black—Hilborn, Gregg.
BLACKBERRIES .	Snyder, Ancient Briton.
GOOSEBERRIES..	Houghton, Downing, Industry.
CURRANTS	White—White Grape. Red—Versaillaise, Victoria. Black—Black Champion.
STRAWBERRIES..	Alpine White, Crescent, Bubach, Captain Jack.

DISTRICT No. 8.—PONTIAC, OTTAWA, MONTCALM.

APPLES	Summer—Yellow Transparent, Duchess. Autumn—Wealthy, Peach, Haas, White Pigeon. Winter—Golden Russet, Pewaukee, La Rue, Arabka, Hibernal.
PEARS	Bessemianka, Flemish Beauty.
PLUMS	Foreign--Blue Orleans, Shropshire Damson, Glass Seedling. American—De Soto, Wolf and Local Seedlings.
CHERRIES	Montmorency, Early Morello, Orel 25, Bessarabian.
GRAPES	White—Lady, Winchell, Moore's Diamond. Red—Moyer, Delaware, Mary, Vergennes. Black—Early Victor, Moore's Early, Peabody, Roger's 17.
RASPBERRIES	White—Golden Queen. Red—Hansel, Turner, Cuthbert. Black—Hilborn, Mammoth Cluster.
BLACKBERRIES	Snyder, Agawam.
GOOSEBERRIES	Houghton, Pearl, Industry.
CURRANTS	White—White Grape. Red—Victoria, Versaillaise, Prince Albert. Black—Lee's Prolific.
STRAWBERRIES	Crescent, Sharpless, Bubach, Capt. Jack.

DISTRICT No. 9.—ARGENTEUIL, TERREBONNE, L'ASSOMPTION, TWO MOUNTAINS.

APPLES	Summer—Yellow Transparent, Duchess. Autumn—White Pigeon, Switzer, Gipsy Girl, Wealthy. Winter—Golden Russet, Scotts Winter, Fameuse, La Rue, Arabka.
PEARS	Bessemianka, Gakovka.
PLUMS	Foreign—Shropshire Damson, Glass Seedling. American—De Soto, Wolf, Wyant.
CHERRIES	Early Morello, Montmorency, Wragg, Orel 25.
GRAPES	White—Lady, Winchell, Duchess. Red—Lindley, Vergennes, Delaware. Black—Moore's Early, Peabody, Aminia, Gibb.
RASPBERRIES	White—Golden Queen. Red—Hansel, Marlboro, Cuthbert. Black—Ohio, Hilborn.
BLACKBERRIES	Agawam, Snyder.
GOOSEBERRIES	Houghton, Pearl, Industry.
CURRANTS	White—White Grape. Red—Victoria, Versaillaise, Red Grape. Black—Lee's Prolific.
STRAWBERRIES	Bubach, Sharpless, Warfield.

DISTRICT No. 10.—VAUDREUIL, SOULANGES, ISLAND OF MONTREAL, LAVAL, JACQUES CARTIER, HOCHELAGA, LAPRAIRIE.

APPLES	Summer—Yellow transparent, Red Astrachan, Duchess. Autumn—St. Lawrence, Golden White, Alexander, Brockville Beauty. Winter—Wealthy, McIntosh Red, Ben Davis, Golden Russet, Winter, St. Lawrence.
PEARS	Flemish Beauty, Beurré d'Anjou, Kurskaya.
PLUMS	Foreign—Quackenboss, Seedling Blue of Montreal. American—De Soto, Wolf, Wyant, Weaver.
CHERRIES	English Red, (Ey. Richmond) Montmorency, Wragg, Griotte Imperiale.
GRAPES	White—Lady Winchell, Moore's Diamond. Red—Delaware, Lindley, Vergennes, Salem. Black—Moore's Early, Worden, Aminia, Peabody, Gibb.
RASPBERRIES	White—Golden Queen. Red—Hornet, Heebner, Marlboro', Cuthbert. Black—Hilborn, Older.
BACKBERRIES	Agawam, Ancient Briton.
GOOSEBERRIES	Foreign—Whitesmith, Industry, Rifleman. American—Pearl, Houghton. Smith's Improved.
CURRANTS	White—White Grape. Red—Victoria, Versaillaise, Moore's Ruby. Black—Black Champion.
STRAWBERRIES	Bubach, Warfield, Beder Wood, Parker Earle, Manchester.

DISTRICT No. 11.—JOLIETTE, BERTHIER, MASKINONGÉ, ST. MAURICE,

APPLES	Summer—Yellow Transparent, Duchess. Autumn—Autumn Strawberry, White Pigeon, Golden White. Winter—Wealthy, Golden Russet, Pewaukee, Arabka.
PEARS	Bessemianka, Gakovka.
PLUMS	Foreign—Seedling Blue, Quackenboss, Blue Orleans. American—De Soto, Rollingston.
CHERRIES	Montmorency, Orel 25, Wragg, Bessarabian.
GRAPES	White—Lady, Winchell. Red—Moyer, Delaware. Black—Early Victor, Moore's Early, Worden.
RASPBERRIES	White—Caroline. Red—Hansel, Heebner, Cuthbert. Black—Hilborn, Ohio.
BLACKBERRIES	Agawam, Ancient Briton.
GOOSEBERRIES	Foreign—Industry, Whitesmith. American—Houghton. Pearl.
CURRANTS	White—White Grape. Red—Victoria, Red grape. Black—Black Champion or Naples.
STRAWBERRIES	Crescent, Capt. Jack, Bubach, Parker Earle.

DISTRICT No. 12.—CHAMPLAIN, PORTNEUF, QUEBEC, MONTMORENCY, CHARLEVOIX.

APPLES	Summer—Tetofsky, Red Astrachan. Autumn—Duchess, White Pigeon, Livland Raspberry. Winter—Golden Russet, Wealthy, Canada Baldwin, Longfield.
PEARS	Bessemianka, Kurskaya.
PLUMS	Foreign—Blue Orleans, Damson, Quackenboss. American—Rollingston, Wyant.
CHERRIES........	Montmorency, Bessarabian, Orel 25, Minnesota Ostheim.
GRAPES.........	Black—Florence, Early Victor, Hartford, Gibb. Red—Moyer.
RASPBERRIES....	White—Golden Queen. Red—Hansel, Heebner, Cuthbert. Black—Hilborn, Ohio.
BLACKBERRIES..	Agawam, Ancient Briton.
GOOSEBERRIES..	Foreign—Rifleman, Industry. American—Houghton, Pearl.
CURRANTS	White—White grape. Red—Red grape, Victoria, Versaillaise. Black—Black Naples.
STRAWBERRIES .	Crescent, Sharpless, Bubach, Capt. Jack.

DISTRICT No. 13.—CHICOUTIMI, SAGUENAY.

APPLES.........	Summer—Tetofsky, Whitney No. 20. Autumn—Duchess, Summer Arabka, White Pigeon. Winter—Antonovka, Ostrekoff, Longfield, Hibernal.
PEARS............	Bessemianka, Gakovka.
PLUMS	De Soto, Rollingston, Wyant.
CHERRIES........	Vladimir, Bessarabian, Riga 18.
GRAPES..	Black—Florence, Gibb.
RASPBERRIES....	White—Golden Queen or Caroline. Red—Hansel, Turner, Marlboro'. Black—Mammoth Cluster, Hilborn.
BLACKBERRIES..	Snyder, Ancient Briton.
GOOSEBERRIES..	American—Houghton, Pearl, Downing.
CURRANTS........	White—White Dutch. Red—Red Dutch, Victoria, Prince Albert. Black—Black Naples.
STRAWBERRIES .	White Alpine, Manchester, Crescent, Capt. Jack.

YIELD OF VINES PLANTED 3 x 4 FEET APART AND TRAINED TO POSTS.

At the time of planting the vines which now make up the vineyard it was thought advisable to make a comparative test of the single stake method, or what is commonly known in France or Germany as the renewal system. For this purpose 325 vines were set out three by four feet apart. Twenty-five plants each of the Early Victor, Brighton, Champion, Merrimack, Wilder, Niagara and Bacchus were set out, and fifty each of Delaware, Concord and Clinton. Each vine was provided with a four and a half foot stake for the support of the three canes, which were allowed to every vine. As far as practicable these canes were renewed every year by young shoots preserved for the purpose from wood of the previous year. It was not always possible to do this but in most instances the plan was carried out. By this system the wood falls into two classes, viz. :—the fruit bearing wood produced last year, and the young canes of this year's growth, which are designed to replace the first set out and become fruit producers next year.

It will be seen by the following tabular statement of returns for the last three seasons, that the pole system is not adapted to the conditions that prevail in the greater portions of Canada, where the most complete utilization of all the available summer heat is a prime requisite to the successful cultivation of the grape.

YIELD OF VINES TRAINED TO STAKES AS AGAINST THE SAME VARIETIES ON TRELLISES.

No. of Vines.	Variety.	Year.	How Trained.	Date of Colouring.	Date of Gathering	Total Yield.	Average per Vine.		Yield per Acre.		Average Yield for three years.
						Lbs.	Lbs.	Ozs.	Lbs.	Ozs.	Lbs.
20	Bacchus......	1891	Stakes.....	Sept. 20..	Oct. 8..	14½		11	2,495	10	3,251
	do	1892	do	do 10..	do 10..	27	1	5	4,764	6	
	do	1893	do	do 8..	do 15..	14¼	0	11	2,495	10	
3	do	1891	Trellis..	do 22..	do 5..	1½	0	8	272	0	6,346
	do	1892	do	do 7..	do 7..	63	21	0	11,424	0	
	do	1893	do	do 9..	do 11..	40½	13	8	7,344	0	
22	Brighton	1891	Stakes......	do 11..	do 10..	52	2	6	8,621	4	4,915
	do	1892	do	do 18..	do 12..	30	1	6	4,991	4	
	do	1893	do	do 14..	do 18..	7	0	5	1,134	6	
3	do	1891	Trellis......	do 12..	do 6..	25	8	5	4,522	0	3,921
	do	1892	do	do 10..	do 6..	22	7	5	3,978	0	
	do	1893	do	do 8..	do 10..	18	6	0	3,264	0	
22	Champion.....	1891	Stakes......	do 4..	Sept. 18..	4	0	3	680	10	9,982
	do	1892	do	do 27..	do 5..	77	3	8	12,705	0	
	do	1893	do	do 26..	do 28..	100	4	9	16,561	14	
3	do	1891	Trellis......	....	....	....	......	......	....		11,968
	do	1892	do	Aug. 27..	Sept. 9..	42	14	0	7,616	0	
	do	1893	do	do 20..	do 1..	90	30	0	16,320	0	
48	Clinton.	1891	Stakes....	Sept. 8..	Oct. 1..	25½	0	8½	1,928	7	3,289
	do	1892	do	do 13..	do 14..	73	1	8½	5,558	7	
	do	1893	do	do 12..	do 18..	32	0	10½	2,382	3	
3	do	1891	Trellis......	do 8..	do 5..	33½	11	5	6,264	0	6,488
	do	1892	do	do 7..	do 10..	33	11	0	6,094	0	
	do	1893	do	do 6..	do 11..	39¼	13	1	7,106	0	

YIELD OF VINES TRAINED TO STAKES, &c.—*Concluded.*

No. of Vines.	Variety.	Year.	How Traiued.	Date of Colouring.	Date of Gathering	Total Yield.	Average per Vine.		Yield per Acre.		Average Yield for three years.
						Lbs.	Lbs.	Ozs.	Lbs.	Ozs.	Lbs.
48	Concord	1891	Stakes	Sept. 8	Oct. 5	201	4	3	15,200	10	11,041
	do	1892	do	do 3	do 10	196	4	1	14,746	14	
	do	1893	do	do 14	do 18	42	0	14	3,176	4	
3	do	1891	Trellis	do 20	do 5	$25\frac{1}{2}$	8	8	4,624	0	6,494
	do	1892	do	do 7	do 6	30	10	0	5,440	0	
	do	1893	do	do 12	do 11	52	17	5	9,418	0	
45	Delaware	1891	Stakes	do 4	do 1	74	1	10	5,898	12	4,650
	do	1892	do	do 7	do 10	88	1	15	7,033	2	
	do	1893	do	do 8	do 16	13	0	$4\frac{1}{2}$	1,020	15	
3	do	1891	Trellis	do 5	do 1	21	7	0	3,808	0	7,684
	do	1892	do	Aug. 30	do 4	$18\frac{1}{2}$	6	2	3,332	0	
	do	1893	do	do 28	do 7	$87\frac{3}{4}$	29	4	15,912	0	
23	Early Victor	1891	Stakes	Sept. 4	Sept. 22	32	1	6	4,991	4	3,974
	do	1892	do	Aug. 30	do 25	54	2	5	8 394	6	
	do	1893	do	do 28	do 28	30	1	4	4,537	8	
3	do	1891	Trellis	Sept. 4	do 21	$5\frac{1}{2}$	1	13	657	14	4,258
	do	1892	do	do 7	do 26	$20\frac{3}{4}$	6	14	3,808	22	
	do	1893	do	Aug. 28	do 26	45	15	0	8,310	0	
22	Merrimack	1891	Stakes	Sept. 4	Oct. 1	75	3	6	12,251	4	8,621
	do	1892	do	do 7	do 3	63	2	14	10,436	4	
	do	1893	do	do 12	do 10	19	0	14	3,176	4	
3	do	1891	Trellis	do 4	do 1	$21\frac{1}{2}$	7	3	3,910	0	7,650
	do	1892	do	do 3	do 6	30	10	0	5,440	0	
	do	1893	do	Aug. 28	do 11	75	25	0	13,600	0	
20	Niagara	1891	Stakes	....	do 1	$11\frac{1}{2}$	0	9	2,041	14	4,386
	do	1892	do	Sept. 7	do 10	44	2	3	7,940	10	
	do	1893	do	....	do 15	$17\frac{1}{4}$	0	14	3,176	4	
3	do	1891	Trellis	Sept. 15	do 15	$31\frac{1}{2}$	10	8	5,712	0	8,432
	do	1892	do	do 10	do 6	36	12	0	6,528	0	
	do	1893	do	do 9	do 10	72	24	0	13,056	0	
22	Wilder	1891	Stakes	do 8	do 1	$77\frac{1}{2}$	3	8	12,705	0	7,373
	do	1892	do	do 8	Did not mature.						
	do	1893	do	do 14	Oct. 10	$11\frac{3}{4}$	0	9	2,041	14	
3	do	1891	Trellis	do 14	do 1	$16\frac{1}{2}$	5	8	2,992	0	5,451
	do	1892	do	do 10	do 4	$15\frac{1}{4}$	5	1	2,754	0	
	do	1893	do	do 6	do 7	$58\frac{1}{2}$	19	8	10,608	0	

When we consider that by the single stake plan over 3,000 vines are planted on each acre, a glance at the comparative returns shows that they do not justify the greater amount of labour involved in growing them under this system.

Effect of Summer Pruning of Vines Trained on the Renewal of French System.

The following table shows very conclusively the benefits of summer pruning when applied to the stake or renewal system. Those unpruned were allowed to grow unrestrained after being tied to the stakes in the spring. They soon formed a dense

canopy of foliage over each stake, and set little fruit which ripened very unevenly. The amount of fruit set in the case of varieties like Brighton, which are in the matter of fertilization, dependant in a measure upon pollen from other varieties, was very small, owing no doubt to the leafy covering surrounding the blossoms. It will be noticed that while the yields of both pruned and unpruned vines are in a decreasing ratio, for in 1892 and 1893 this feature is much more prominent in the case of the unpruned vines.

YIELD of Pruned and Unpruned Grape Vines.

Number of vines.	Variety.	Trained to Stakes.	1882. — Yield.		1893. — Yield.		Two year average per vine.
			Lbs.	ozs.	Lbs.	ozs.	Pounds.
3	Bacchus	Unpruned	4	8	1	0	91
3	"	Pruned	3	15	2	1	1·00
3	Brighton	Unpruned	7	4	none.		1·83
3	"	Pruned	4	2	0	15	·84
2	Champion	Unpruned	3	4	7	4	2·62
3	"	Pruned	10	8	13	11	6·04
3	Clinton	Unpruned	4	8	2	0	1·08
3	"	Pruned	4	9	1	15	1·08
3	Concord	Unpruned	5	12	0	12	1·08
3	"	Pruned	12	3	2	10	2·46
3	Delaware	Unpruned	5	0	0	12	·91
3	"	Pruned	5	13	0	12	1·09
3	Early Victor	Unpruned	3	8	0	8	·81
3	"	Pruned	6	15	3	12	1·78
3	Merrimack	Unpruned	9	4	2	0	1·87
3	"	Pruned	8	10	2	10	1·87
3	Niagara	Unpruned	8	8	0	8	1·25
3	"	Pruned	6	9	2	10	1·53

EXPERIMENTS IN FALL AND SPRING TRANSPLANTING.

Opinions vary much with regard to the relative success and advantage of transplanting trees in the fall or in the spring. Some advocate fall planting, while others favour setting in spring. The effect of transplanting apple trees in the autumn in this locality has already been recorded in the report of the Horticulturist for the year 1888, p. 78.

In this connection Mr. Hilborn says: "216 apple trees were transplanted from the nursery rows in the autumn of 1887, to an orchard, with a view of testing the relative merits of fall and spring planting."

"When the snow disappeared in spring it was found that nearly all these autumn planted trees were more or less injured, many of them killed to the snow line. The fact that such varieties as Duchess of Oldenburg, Tetofsky and Fameuse,—of which there are healthy bearing trees growing unharmed within a short distance of the farm—suffered equally with the tender sorts, showed clearly that these failures were due to the unfavourable season for planting, rather than the lack of hardiness of some of the sorts tested."

In this instance it is reasonable to suppose that the injury would not have been so severe but for the unusually cold weather of the previous winter; it is right to conclude, however, that fall planting of fruit trees cannot be safely practised in this locality and in other places with similar climatic conditions.

With the object in securing data on the same subject, with regard to forest trees, the following experiment was carried out. Thirty trees each of Green Ash (*Fraxinus viridis*), Black Walnut (*Juglans nigra*), Red Oak (*Quercus rubra*) and European Mountain Ash (*Pyrus aucuparia*), were selected in the autumn of 1892. These had for three years been in nursery rows under good cultivation and were thrifty trees eight to ten feet high. Each variety was separated into three lots of ten trees each; the first assortment being planted without pruning; the second having three-quarters of the last season's growth removed, while the tops of the trees in the third lot were cut back to the main stems. They were then carefully set in rows four feet apart, and three feet apart in the row.

In the spring of 1893, on the approach of the planting season, a duplicate collection of the same varieties was made and treated in a manner similar to those which had been set out the fall previous.

The following tabular data gives the results in detail:—

SHOWING the Average growth and condition of the same Varieties of Forest Trees planted in the Fall and in the Spring.

Variety.	When Transplanted.	How Pruned.	Number Transplanted.	Number Growing.	Average Growth.	Condition.	Remarks.
					Inches.		
Green Ash	Fall	Not pruned	10	10	8	Healthy	
do	Spring	do	10	10	7½	do	
do	Fall	Branches cut back	10	10	10	do	Some dead points.
do	Spring	do	10	10	18	do	
do	Fall	Cut back to main stem	10	10	18	do	Some dead wood.
do	Spring	do	10	10	16	do	Not as strong as last.
Black Walnut	Fall	Not pruned	10	10	4	Injured.	Killed back 6 to 12 inches.
do	Spring	do	10	10	4½	Healthy	Few dead points.
do	Fall	Branches cut back	10	10	9	Injured	Killed back 3 to 6 inches; sunscalded.
do	Spring	do	10	10	8	Fair	Some dead points.
do	Fall	Cut back to main stem	10	10	10	Injured.	Badly killed back.
do	Spring	do	10	10	12	Healthy	No dead points.
Red Oak	Fall	Not pruned	10	8	5	Injured	Sunscalded.
do	Spring	do	10	10	5½	Healthy	Even growth.
do	Fall	Branches cut back	10	10	5½	Injured	Weak tufty growth.
do	Spring	do	10	9	4	Weak	do
do	Fall	Cut back to main stem	10	10	12	Injured	Dead points 3 to 6 inches.
do	Spring	do	10	10	10	Weak	Growth uneven.
European Mountain Ash	Fall	Not pruned	10	7	8	do	Killed back and sunscalded.
do do	Spring	do	10	10	8	Healthy	Even growth.
do do	Fall	Main branches cut back	10	10	10	Fair	Sunscalded.
do do	Spring	do	10	10	10	Healthy	Even growth.
do do	Fall	Cut back to main stem	10	8	15	Fair	Uneven growth.
do do	Spring	do	10	10	15	Healthy	Even growth.

Some of the effects not clearly shown in the table were the much greater amount of dead wood, the more frequency of the sun scalds, and the unevenness of the growth of the fall planted trees, as compared to those set out in the spring.

These results are more marked in the case of the tenderer varieties and those most difficult to transplant, such as Black Walnut, Red Oak and Mountain Ash. In the case of Green Ash, which is very hardy, and one of the easiest trees to transplant, slightly greater growth was made by those transplanted in the spring; otherwise there was no difference between the two sets. On the whole it is safe to conclude that in the case of trees which do not transplant easily and which are not strictly hardy, spring planting is attended with better results than autumn planting.

PRUNING OAKS IN MID-SUMMER.

The following experiment was suggested incidentally in connection with the too severe summer pruning of a number of oaks standing in nursery rows. These had been trimmed higher than desired, and in order to learn if it was possible to form a new head the same season, they were cut back in July with the results delineated below:—

A. Three trees cut back to one year old wood.—These made a feeble start the same year, and produced a growth of a few inches which was winter killed.

Their condition in the fall of 1893, was as follows:—

No. 1.—Dead.

No. 2.—To the ground.

No. 3.—Sprouting feebly at two feet from the ground.

B. Three trees cut back to two year old wood.—No. 1, grew six inches the same season and eighteen inches the following summer. Fairly healthy but slightly sun scalded.

No. 2 and 3 made a slight growth the same summer, and a growth of fourteen to sixteen inches in 1893. Numerous dead points on all three.

C. Three trees cut back to three year old wood.—Each made a growth of from six to twelve inches the same season. During 1893 a growth of fifteen to twenty inches was made of well ripened wood. All fairly vigorous and healthy. Dead points not prominent.

D. Three trees cut back to four year old wood.—No. 1, made a growth of ten inches which was slightly killed back the first year; 1893 a strong growth was made, but the tree was ill-shapen and spreading.

No. 2, made a weak growth which was mostly killed back the following winter.

No. 3, was killed to the ground last winter.

We can readily gather from the above that trees, however hardy and vigorous should not be heavily pruned during the season of active growth, and also that in the case of Red Oak, adventitious buds (by whose agency foliage is renewed) are most easily developed on three year old branches; so that if severe pruning is necessary during summer, it is best to cut back at once to this point.

PROPAGATION OF ORNAMENTAL SHRUBS AND CONIFERS.

The ease with which many of our most valued ornamental shrubs may be propagated is not generally understood and appreciated. The methods employed in multiplying such fruits as grapes, currants and gooseberries, which may or should be classed among the necessities of life, are universally understood, and there is little excuse for any one—no matter how small the number of plants he starts with—if he does not increase the number sufficiently to meet the home demand.

With ornamental shrubs a more general knowledge of simple methods of propagation by the farmer, would give an increased interest and would redound to the benefit of the planter as well as the nurseryman.

The following methods have been employed here in multiplying varieties desired for lawn or decoration on this and the Branch Farms :

1. PROPAGATING FROM CUTTINGS OF THE RIPENED WOOD.—This method is attended with such slight inconvenience and difficulty as to render it practicable to every one having a small area of cultivated ground available.

In October, select a warm and well drained situation, stretch a garden line and open a trench eight or ten inches deep and the width of a spade. It will be an advantage to have one side of the trench slanting instead of perpendicular, against which to lay the cuttings. The soil at the bottom of the trench should be mellowedby digging.

Cuttings of the ripened wood of the current year's growth are then made by cutting it into nine inch lengths. These are stuck in the soil on the slanting side of the trench at regular distances of six inches apart. The earth is then filled in and carefully packed about the cuttings till level with the surface, leaving only the upper bud of each cutting in sight. They may remain in this condition till freezing weather, when the rows should be covered with a mulch of leaves or coarse manure.

The mulch should be removed the following spring and the cuttings be given good cultivation. At the end of the season a large proportion of the varieties mentioned below, will have become well rooted and have made a considerable growth; being large enough in some instances to transplant to the lawn or border.

The following classes of flowering shrubs are easily propagated in this way :—

Honeysuckle (*Lonicera*) erect and trailing.
Spiræa including bridal wreath, and nine bark.
Barberry (*Berberis*) also easily grown from seed.
Siberian Pea tree (*Caragana*) beautiful in spring.
Weigelia (*Diervilla*) Spring and summer flowering shrubs.
Japan Rose (*Rosa Rugosa*) summer blooming.
Tamarisk (*Tamarix*) Foliage beautiful.
Snowball (*Viburnum opulus*) grows most readily from layers.
Cytisus, closely allied to the laburnums.
Shrubby Five-finger (*Potentilla*) summer flowering.
Sea Buck-thorn (*Hippophae rhamnoides*).
Siberian dog wood (*Cornus Siberica*) propagates best by layering.
Syringa (*Philadelphus*) the common mock orange.
Deutzia (*Deutzia*) White flowers in early spring.
Carolina Allspice (*Calycanthus Floridus*) Spring flowering.
Smoke tree (*Rhus cotinus*) Autumn flowering.
Southern wood (*Artemisia*).

This list includes a large proportion of the most desirable plants of deciduous habit suitable for lawn decoration in this vicinity

2. PROPAGATING FROM GREEN WOOD.—By this method cuttings are taken early in August from the unripened tips of the current year's growth. They should be four to six inches in length and be prepared by removing all the leaves except three or four of those last developed. They are then planted three inches deep in rows in a frame supplied with soil of equal parts of sand and loam. The frame is then covered with hot-bed sash, which is carefully shaded till the plants become rooted. The cuttings should be carefully watered and aired during this period.

On the approach of winter the rooted plants may be either taken up and stored in a cold cellar or be protected with a mulch in the frame.

Nearly all the plants mentioned in the preceding list may be propagated in this way, but it is specially useful for striking plants of the beautiful large flowered Hydrangea (*H. Paniculata grandiflora*) which can be multiplied in this manner with as much ease as the geranium.

PROPAGATING RETINOSPORAS AND THUJAS BY CUTTINGS.

There is no class of evergreen plants so useful for house culture in winter as potted plants, or for lawn decoration, as the various species belonging to the genus *Retinospora*, commonly called Japan Cypress, and to those may be added numerous forms of dwarf cedar (*Thuja*). It is a matter of regret that florists do not grow them more frequently as potted plants, when they may be rooted so easily.

The following method has been adopted here with excellent results:—

The cuttings are made in October by selecting side shoots, which are separated from the stem with the "heel" attached. A heel cutting is one provided with the thickened knot or joint found at the base of each branch. The lower branchlets are trimmed off and the cuttings inserted in boxes of sandy soil, which are kept in a cool part of the green-house, where the temperature does not exceed 50 degrees. The soil should be kept uniformly moist. In February they will have calloused, which is the preparatory stage of rooting. They should then be given more heat, when they will root freely and will be ready for setting in nursery rows or potting by the time spring opens.

During the winter of 1891 twenty varieties of *Thuja* were propagated in this way, over 40 per cent of the cuttings of each kind rooting. With *Retinosporas* the returns are much better.

EXPERIMENTS IN PROPAGATING CHERRIES.

Root Grafting.

A comparative test was made in 1892 with the object of showing the relative success which might be looked for, in grafting Morello cherries upon the common commercial stocks.

The work of root grafting was performed according to the method outlined in Bulletin No. 17, reasonable precautions being taken to secure a good stand. The grafts were set in nursery rows early in May, 1892, and given clean cultivation. The results are given below:—

Variety.	Stock.	No. Grafted.	No. which grew.	Per cent
Orel 23	Mazzard	50	13	26
Orel 23	Mahaleb	41	None.	
Lutovka	Mazzard	50	19	38
Lutovka	Mahaleb	50	8	16
Bessarabian	Mazzard	50	14	28
Bessarabian	Mahaleb	50	None.	
Vladimir	American Plum	50	3	6
Vladimir whip graft	do	25	6	24
Spate Amarelle	do	50	2	4
Shadow Amarelle	do	50	5	10

The above results are so poor as to render impossible the profitable propagation of cherries by these methods. It is true, however, that they may be much below the returns of professional propagators. Mazzard makes much the best showing. Success varies from year to year, according to the season, the care of the graft exercised in carrying out the details connected with the operation of grafting. Much also depends upon the condition of the soil and weather at the time of setting out the grafts. On the whole it is safer for the amateur to crown graft in the spring upon stocks planted the year previous.

The following results have been obtained in propagating cherries by crown grafting.

Variety.	Stock.	No. Grafted.	No. Grown.	Per cent
Vladimir	Mahaleb	100	92	92
Lutovka	do	100	88	88
Bessarabian	do	100	95	95
Shadow Amarelle	do	19	16	84
Gruner Glas	do	62	35	56
Orel 24	do	68	42	61
Wragg	do	15	12	80

Bird Cherry Stocks (*Prunus Pennsylvanica.*)

This native cherry has much to commend it as a propagating stock, but also possesses a few serious defects.

It is hardy and easily grown from seed. On the other hand, its growing season is so extended, and growth so rapid and succulent during that period, that it is often difficult to hit upon the most favourable time for budding. Several hundred were budded late in August of 1892, but with poor success, owing to the large amount of sap in the stocks at the time of budding, which prevented the immediate union of the buds. Growth continued till arrested by frost late in September. In order to prevent the stocks from being girdled by the fibre used in tying, it was necessary to loosen and re-tie, twice after the buds were inserted.

This year the stocks were not budded until the first week in September, and less difficulty from over-growth was experienced, and better results are looked for.

VEGETABLES.

Experiments with Cauliflowers.

A varietal test of cauliflowers was carried on this season. Twenty plants each of twenty-eight varieties were set out on 3rd June. The seed from which these were grown was sown in hot bed 4th April, and pricked into a cold frame, 28th April. The ground was prepared by deep fall ploughing and dressing with barnyard manure at the rate of 75 tons to the acre. The plants were set in rows, three by two feet apart and cultivated with a Planet jr. horse cultivator. As the heads matured they were weighed and the weights recorded with dates of cutting. The results are embodied in the subjoined table. Some of the late varieties were injured by root maggots which were not detected soon enough to be successfully treated with hellebore. The season on the whole was favourable for the development of firm crisp heads of good size.

Cauliflowers.

Variety.	Seedsman.	Per cent germinated.	Transplanted.	Date of 1st cutting.	Date of last cutting.	Percentage of Plants headed.	Total Weight.	Average Weight.
							Lbs.	Lbs. ozs.
Autumn Giant	Thorburn	61·	June 3.	Sept. 30	Oct. 30	85·	56¾	3 5
Early Asiatic	Landreth	79·	do 3.	Aug. 13	do 20	85·	63	3 11
Early Boston	Faxon	78·	do 5.	July 20	Sept. 9	60·	34	2 13
Earliest Dwarf Erfurt	March	79·	do 5.	do 17	do 19	70·	54¼	3 14
Early Dwarf Erfurt	Thorburn	91·	do 3.	do 29	do 19	85·	43¾	2 9
Early Perfection	March	57·	do 5.	do 17	do 6	94·4	41	2 6
Early Long Island Beauty	do	93·	do 5.	Aug. 8	do 6	80·	38½	2 6
Early Paris	Thorburn	79·	do 3.	do 5	do 6	65·	19½	1 8
Early Snowball	March	88	do 3.	July 18	do 19	86·6	44¾	3 7
Early Walcheren	Thorburn	74·	do 3.	Sept. 19	Oct. 20	80·	42	2 10
Extra Early Dwarf Erfurt	do	29·	do 3.	Aug. 5	Sept. 19	85·	41	2 6
Extra Early Whitehead	Steele	......	do 5.	July 17	Aug. 20	70·	18	1 4

CAULIFLOWERS.—*Con.*

Variety.	Seedsman.	Per cent germinated.	Transplanted.	Date of 1st cutting.	Date of last cutting.	Percentage of Plants headed.	Total Weight.	Average Weight.	
							Lbs.	Lbs.	
Giant Purple early........	Childs......	94·	June 3.	Sept. 6..	Oct. 28..	60·	76½	5	7
Giant Purple late..........	do ..	95·	do 3.	do 6..	do 20..	35·	68	9	0
Giant White Pearl.......	Pearce.....	82·	do 3.	July 26..	Sept. 11..	85·	68	4	0
Gilt Edge Snowball.........	Thorburn ..	86·	do 3.	do 29..	do 19..	100·	50¼	2	8
Half Early Dwarf French....	do ...	92·	do 3.	do 29..	do 6..	80·	22½	1	6
Imperial Novelty........ ...	Landreth...	45·	do 3.	do 17..	Oct. 20..	88·8	14¼	1	12
Italian Taranto............	Thorburn ..	58·	do 3.	Oct. 2..	do 20..	35·	32	4	9
Landreth's 1st..............	Landreth...	67·	do 3.	July 26..	Sept. 11..	42·8	12	2	0
Large Algiers..	Thorburn ..	72·	do 3.	Sept. 6..	do 26..	70·	44½	3	2
Large Early London	do ...	70·	do 3.	Aug. 14..	Oct. 20..	95·	46¾	2	7
Large Early Dwarf Erfurt...	do ...	58·	do 3.	July 17..	do 2..	92·3	27½	2	4
Le Normand Short Stem.....	do ...	77·	do 3.	Aug. 8..	Aug. 23..	70·	16	1	2
Non Pariel..	do ...	76·	do 3.	do 20..	Sept. 6..	45·	7	0	12
Snowball....	March...	92·	do 5.	do 2..	do 6..	85·	41¼	2	6
Stadtholder................	Thorburn...	60·	do 3.	Sept. 6..	Oct. 4..	45·	34¾	3	13
Veitch's Autumn Giant......	Steele Bros..	85·	do 5.	do 6..	do 20..	15·	9¾	3	4

Results :

Gilt-edge Snow-ball (Thorburn) gave the highest number of matured heads, averaging 2½ lbs. each. This was the most satisfactory early sort.

Giant White Pearl (Pearce). A medium early variety of good size, headed evenly and yielded 85 per cent of solid heads, with an average weight of 4 lbs. each.

EARLY SNOWBALL (March), This from American grown seed proved one of the best early kinds. Its maturing season covered two months, beginning July 18th, which would be an advantage to the amateur, but a drawback to the market gardener; 86 per cent matured with an average weight of 3½ pounds per head.

American grown seed gave very satisfactory returns with regard to vitality.

Among the late varieties, *Large Algiers*, *Autumn Giant* and *Giant Purple Early* were the most satisfactory.

TREES, CUTTINGS, SEEDS, AND SCIONS DISTRIBUTED.

In order to assist the Quebec Government in furthering the very useful line of experimental work in horticulture inaugurated last year—that of establishing trial fruit stations in each county—the following varieties of apples were supplied by the Central Farm :—

Variety.	No. of Trees.	Season of Fruit.
Sweet Stripe..........	50	Fall.
Bogdanoff	25	Winter.
Charlamoff..........	75	Summer.

Variety.	No. of Trees.	Season of Fruit.
Cross, 15 m	75	Early winter.
Flat Voronesh	40	Fall.
Gipsy Girl	25	Early winter.
Arabka	40	Late winter.
Kara Synap	15	Winter.
Rosy Repka	100	Summer.
Simbirsk No. 4	25	Early winter.
Borovinka	100	Autumn.
Cross, Dept	50	Winter.
Antonovka	60	Early winter.
Orel, No. 5	100	Autumn.
Sklanka, Bog	75	Winter.
Voronesh Glass	50	Winter.
Good Peasant	75	Winter.
Early Sweet	75	Summer.
Osimoe	50	Winter.
Grandmother	25	Autumn.
Simbirsk No 1	100	Early winter.

Through the Ontario Fruit Growers' Association, a number of new seedling black currants have been sent out for trial to different parts of the province. In addition to these, 100 *Rosa rubrifolia* (red-leaved rose), 75 *Spiræa rotundifolia* (round-leaved spiræa), were distributed through the same medium, together with 500 plants each of Colorado blue spruce (*Picea pungens*), yellow pine (*Pinus ponderosa*), and Douglas fir (*Pseudotsuga Douglasii*).

Cherry Scions.

In response to the offer of cherry scions for propagating purposes, of the varieties described in Bulletin No. 17, a large number of applications were received. Many of the applicants were labouring under the erroneous impression that trees instead of scions, would be sent them. One hundred and twenty-eight packages were distributed, covering every province in the Dominion, a large proportion going to the Maritime Provinces. Very satisfactory reports have been received from many who were successful in propagating them.

Manitoba and North-west Territories.

Another distribution of seeds and cuttings of hardy forest trees was made to the Western Provinces. The details are contained in the following table:—

Packages of Plants, Cuttings, &c., Distributed.	Manitoba. — No. of Packages.	North-west Territories. — No. of Packages.
Forest trees	449	381
Cuttings	501	297
Cuttings and trees	177	27
Cherry scions	30	13
Fruits	128	52
Box elder seed	796	533
Ash seed	142	52
Asparagus seed	936	582

The following varieties of Russian apples were used in making up the packages of fruits, in addition to plants of the leading varieties of currants:—

Antonovka,	Karabovka,
Aport, 252,	Ledenetz,
Arkad, Vor.,	Orel, No. 6,
Anisovka,	Orel, 27,
Borovinka,	Rosy Voronesh,
Blushed Calville,	Repka Aport,
Cross, Vor.,	Red Streak,
Cinnamon, Vor.,	Simbirsk, No. 1,
Cinnamon Pine,	Simbirsk, No. 2,
Gipsy Girl,	Simbirsk, No. 3,
Golden Reinette,	Simbirsk, No. 5,
Knievskoe,	Vargul.
Kruder,	

EXPERIMENTS WITH TOBACCO.

Some preliminary experiments were undertaken in the cultivation of tobacco, with a view of obtaining information with regard to the varieties best suited to the climate of Eastern Ontario and the province of Quebec; and the most approved methods of handling the young plants previous to setting out.

Seed of thirty-one varieties was sown in a mild hotbed on April 24th, 1893, in rows six inches apart. Germination took place very uniformly in ten days. On May 30th, half the number of plants of each variety were transplanted, pricking them out in a cold frame in rows eight inches apart and three inches apart in the row. On June 6th they were transplanted to the field, which was a thoroughly tilled piece of gravelly loam, that was cropped with beans the previous season, ploughed in the autumn and dressed in the spring with barn-yard manure at the rate of 50 tons per acre.

The ground was cultivated sufficiently with a Planet Jr. horse cultivator to keep down all weeds, and as long as the cultivator could pass between the rows without injuring the plants, which were set three and a half feet apart each way. This distance was found to be sufficient for the smaller and more upright varieties such as "Canadian" and "Cannelle," but did not afford enough space for large leaved vigorous kinds like "Conqueror" and "Pennsylvania Seed Leaf."

A striking difference was noted in the relative rapidity of growth of plants, which had been transplanted in hotbed, and those of the same variety set out from the original seed bed. Those transplanted in hotbed were much stockier and stronger, as might reasonably be expected, did not flag after setting in the field, and lost no time in becoming established.

As the following tabular statement shows, very few plants had to be replaced of those which were transplanted in hotbed. On the other hand, those which had not been transplanted in the hotbed were much slower in taking root and many more of these had to be replaced, as indicated in the table.

The difference in the two sets was quite plainly visible for the greater part of the summer, in fact till "topping" had taken place.

It should be stated also that in pricking out, the plants were taken in such a manner as to thin regularly those remaining, in order to allow of even development and prevent a spindling and weakly growth.

Harvesting after the "single leaf method" described in general notes which follow on the cultivation of tobacco took place Sept. 15th.

The leaves were separated into two grades, according to soundness and size, and the figures in the weight columns represent how much the leaves of each variety weighed green, immediately after picking. The second column of weights represent the amount which the same leaves weighed after drying previous to sorting and tying in "hands." The estimated returns per acre show that tobacco, as far as quantity is concerned, can be successfully grown in this and other localities having like climates.

TOBACCO.

Variety.	Seedsman.	Number set out.	Number replaced.	Size of Leaf.	Weight, Green. 1st Grade.		Weight, Green. 2nd Grade.		Number of Plants.	Estimated Weight per Acre. Green.	Weight, Dry. 1st Grade.		Weight, Dry. 2nd Grade.		Estimated Weight per Acre. Dry.
				Inches.	Lbs.	ozs.	Lbs.	ozs.		Lbs.	Lbs.	ozs.	Lbs.	ozs.	Lbs.
Brazilian American, transplanted........	Thorburn........	20	0	29×16	31	12	2	9	17	7,326	4	2½	1	½	1,107
do not do	do	20	4	....	31	8	5	4	18	7,411	4	4	0	12½	1,014
Climax do	do	20	0	29×18	41	10	9	14	19	9,839	5	13	2	12½	1,636
do not do	do	20	6	....	29	14	12	4	15	10,035	2	13	2	2¾	1,210
Canadian do	Evans.............	82	0	26×14	120	0	45	0	82	7,304	16	12½	6	7¼	1,004
do not do	do	41	12	....	67	0	21	0	41	7,791	8	1	3	3¾	1,000
Canelle do	Foucher...........	82	0	19×12	64	4	20	0	75	4,070	10	14½	2	8	648
do not do	do	41	30	....	17	0	10	0	32	3,062	2	9¾	0	11½	367
Connecticut Seed Leaf do	Thorburn	20	1	....	59	0	16	4	19	14,376	8	11½	0	13½	1,826
do not do	do	20	4	....	63	0	13	12	20	13,930	6	9¾	2	0	1,582
do do	Foucher...........	82	3	33×15	219	0	65	0	80	8,429	27	15	10	1¼	1,725
Conqueror do	Thorburn	20	1	29×17	32	4	13	12	20	8,349	5	1¼	2	6¾	1,361
do not do	do	20	6	....	24	0	6	0	20	5,445	3	8¼	1	½	825
Hondurus do	do	20	2	29×15	50	4	13	0	20	11,479	5	3½	1	12¼	1,267
do not do	do	20	8	....	88	10	....		18	17,872	5	12¾	....		1,169
Hestor..............................	Landreth..........	20	1	30×18	31	4	13	8	19	8,549	4	15¾	2	3¾	1,379
Havana Partidas, transplanted..........	do	20	3	18×11	7	4	3	10	18	2,142	1	6¾	0	10¼	214
Havana Vuelta Abajo................	do	20	0	16×10	12	4	3	10	20	2,904	2	2	0	11½	516
Imported Havana, transplanted........	Thorburn.........	20	2	21×14	24	0	3	0	20	4,900	2	2¼	0	8	322

do not do	do	20	10	....	10	4	2	0	11	4,042	1	$7\frac{3}{4}$	0	7	634
Muscat de Perse	Foucher	20	0	26×13	23	6	8	10	20	5,808	3	$6\frac{1}{2}$	1	6	867
Oronoka White Stem, transplanted	Thorburn	20	0	29×14	16	12	8	4	20	4,537	5	$2\frac{3}{4}$	1	$5\frac{3}{4}$	1,185
do Yellow do	do	20	0	32×15	41	8	9	10	20	9,347	5	$8\frac{1}{4}$	2	2	1,386
do do not do	do	20	10	....	63	10	....		17	13,448	4	$14\frac{1}{4}$	....		1,044
Pennsylvania Seed Leaf do	do	20	0	37×17	69	12	15	8	18	17,192	6	8	2	$1\frac{3}{4}$	1,736
do not do	do	20	8	....	35	12	15	0	18	10,234	4	8	2	5	1,373
Persian Rose do	do	20	1	26×12	34	4	4	10	20	7,078	3	$8\frac{3}{4}$	0	$14\frac{1}{4}$	805
do not do	do	20	2	....	56	8	9	8	20	11,979	6	$8\frac{1}{2}$	1	$3\frac{1}{2}$	1,406
Pryor Yellow do	do	20	0	....	43	8	11	0	20	9,891	5	$2\frac{1}{4}$	1	$4\frac{1}{2}$	1,165
do not do	do	20	1	33×17	....		7	0	19	8,555	4	$15\frac{3}{4}$	1	3	1,180
Pryor Blue do	do	20	1	28×14	32	4	14	12	20	8,100	4	$11\frac{3}{4}$	2	$1\frac{1}{2}$	1,420
Persian Muscatelle	Childs	20	0	25×15	26	10	6	10	20	6,034	3	$13\frac{1}{4}$	1	0	876
Safrano, transplanted	Thorburn	20	0	33×16	41	0	16	0	16	12,931	5	$8\frac{3}{4}$	2	$2\frac{1}{2}$	1,747
Sterling do	do	20	0	25×15	41	0	11	0	20	9,438	5	4	1	$10\frac{3}{4}$	1,256
Sumatra do	Landreth	20	0	17× 8	2	10	1	10	20	771	1	$3\frac{1}{4}$	0	10	328
Tennessee, Red, transplanted	Thorburn	20	1	33×17	53	0	13	0	20	11,979	7	$\frac{1}{2}$	2	6	1,707
do not do	do	20	6	....	58	4	9	0	20	12,205	5	$9\frac{1}{2}$	1	$4\frac{3}{4}$	1,250
Tuckahoe do	do	20	1	29×16	30	0	14	0	20	7,986	4	$5\frac{1}{2}$	2	$3\frac{3}{4}$	1,193
Virginia Oak Hill, Yellow	do	20	1	22×16	32	14	7	10	20	7,350	4	8	1	$4\frac{3}{4}$	1,052
White Burley, transplanted	Dreer	20	0	....	36	14	....		19	7,068	7	11	....		1,468
do not do	do	20	9	....	15	14	4	2	10	7,260	2	15	0	$13\frac{3}{4}$	1,378
do do	Foucher	82	5	36×16	116	8	20	4	59	8,535	20	7	2	$11\frac{3}{4}$	1,425
Yellow Mammoth	Thorburn	20	1	34×17	57	12	12	8	20	12,750	7	5	1	$14\frac{1}{2}$	1,676

The varieties which have succeeded best both as to yield and time of ripening are *Canadian*, *Connecticut Seed Leaf*, *Pryor Yellow* and *White Burley*.

HINTS ON TOBACCO CULTURE.

For the benefit of those who are unacquainted with the tobacco plant and its culture, the following brief outline of the course usually adopted in the management of this crop is appended.

That group of plants known to Botanists as members of the genus *Nicotiana* is a large one, and includes many useful decorative plants as well as the tobacco of commerce. The genus was named after Jean Nicot, who introduced tobacco into France in the latter half of the 16th century. *Nicotiana tabacum* and *Nicotiana Persica* with their varieties include most of the cultivated tobaccos.

The development of this industry has proceeded with great rapidity. With the French colonists of the Detroit River region and of the province of Quebec came seed of this plant to Eastern North America. In the eastern portions of this province long continued selection of home-grown seed has given rise to varieties peculiar to the region. These are usually smaller leaved hardy varieties that do not attain the height of Southern forms. The yield, however, is usually very satisfactory, and with the exercise of skill in harvesting and curing, there is no doubt that an easily marketable product of good quality can be produced.

Soil.

A soil which is deep, friable, rich, dry and warm, and one which may be easily traversed by the numerous tender fibrous roots of this plant, is advisable in this climate in order to hasten early maturity. A sheltered situation is also very desirable. Tobacco is peculiarly a farmer's crop inasmuch as there are few farms which do not afford an acre or half an acre of the above description.

Manures.

Analyses of the stems and leaves of tobacco reveal the fact that this plant draws heavily on the potash of the soil, so that in growing it a proper rotation of crops is desirable, and a careful return to the soil of those elements of fertility which have been withdrawn is of course necessary.

The following analyses are taken from the Report of the Massachusetts Experiment Station for 1892.

Substance Analysed.	Nitrogen.	Average.	Potash.	Average.	Phos. Acid.	Average.	Lime.	Magnesia.
Tobacco leaf........	2·75	2·52	7·24	6·44	·43	·51	4·17	2·17
Tobacco stems.	2·29	2·52	6·44	6·44	·60	·51	3·89	1·23

The above figures show the principal elements extracted from the soil in growing this crop, and indicate the desirability of returning them if the best results are looked for.

It should not be forgotten that the fertilizing constituents are nearly equally divided between the stalk and the leafy matter, and therefore, the utilization of the stalks for fertilizing purposes is an important feature in the economical culture of this plant. It has been estimated by Mr. Loomis of the Connecticut Experiment Station (Report for 1887, p. 84), that "the stalks contain about as much nitrogen and potash as would be furnished by an application of 70 pounds muriate of potash

and 300 pounds of cotton-seed meal per acre. The latter would, however, contain nearly twice as much phosphoric acid." In other words, about four tons of barn-yard manure would be needed, from which to obtain an equal amount of potash, as is contained in the stalks from an acre, but one and a half tons of barn-yard manure will furnish an equal amount of nitrogen.

It will be seen then that potash and lime are specially required, and soils in which these elements are present in large quantities produce a leaf of superior burning qualities.

Raising Plants.

Seed should be sown in a hotbed between the 10th and 20th of April; the latter date is usually the right time for this locality. In twenty days the plants should be ready to transplant to a cold frame in the manner already described. Such a course of treatment as will produce good tomato plants may be pursued with every assurance of success.

The time of setting out will depend somewhat on the locality, it must not take place till after all danger of frost is over—in this locality from May 24th to June 10th.

Transplanting and Cultivating.

The large leaved varieties should be set in rows, four feet apart and three feet apart in the row. The rows are easily lined out with a corn marker. Three feet apart each way will give sufficient space to the smaller growing sorts; such as the "Canadian" and the Turkish varieties. Although a cloudy day is preferable for transplanting, yet if plants have been handled as above described, and carefully taken up with a ball of earth attached to the roots of each, there is little need of delaying the work by waiting for clouds or rain. Like all young plants frequent cultivation is very necessary to the rapid growth of the tobacco plant, and the soil should be stirred at least once in ten days, up to the period when the plants are "topped."

Priming and Topping.

"Priming" is the term used to designate the removal of one or two of the lower or primary leaves, which are inferior in size and frequently become torn and injured by the cultivator.

"Topping" is the more important operation of removing the flower stalk, with one or more of the upper and smaller leaves. The energies of the plant are thus diverted from the natural channel—the production of seed—to the more perfect development of its leafy tissues. After topping, numerous suckers will appear in the axils of the leaves; those should be promptly removed.

Harvesting.

It is difficult to describe with sufficient accuracy for identification, the appearance of the tobacco leaf when it has arrived at the proper stage for cutting. The proper time for harvesting is more easily pointed out in practice than intelligently described. When maturity is reached the leaf loses its deep green, taking on a yellow hue, which in some varieties is mottled with deeper markings of the same colour. At this stage, if the tip of the leaf is doubled back, the mid rib will break with a clean fracture.

There are two principal methods of harvesting the crop:

1. Cutting the plant at the ground, and hanging the whole stalk while it is being dried.

2. Stripping the leaves from the plants in the field as they ripen, and stringing them on wires which are attached to laths, in such a manner as to allow each lath

with its load of leaves to be handled separately. The latter is the ideal method and one which is being introduced into many of the tobacco-growing regions of the United States with excellent results. It entails, however, a greater amount of labour than the first and older method, and at a season when the farmer is usually pressed for time. When the former method is adopted the plants are strung on laths either by piercing or splitting the stalks. After being allowed to wilt for a short time they are taken to the curing house or barn.

The best drying-houses are now supplied with a system of heating flues which hastens and facilitates the process of drying, which without these aids takes from four to six weeks according to the humidity of the atmosphere and the system of harvesting employed: the whole plant taking longer, of course, than if the "single leaf method" is adopted.

The leaves are next stripped from the plants and graded according to their quality and size, in bundles called "hands" containing a dozen leaves each.

FERMENTING.

In order to give the leaves a uniform colour the "hands" are arranged in a compact heap with butts outward, in which condition they remain till heating commences: when the thermometer in the centre indicates a temperature of 100 to 110 degrees the "bulk," as this heap is technically called, is opened and rearranged so that the outer tiers are brought to the centre. After the process of fermentation has been completed the "bulk" is opened, the "hands" taken out and arranged in loose tiers where they are gradually cooled.

In the case of fine cigar tobaccos the leaves are again sorted before packing in bales or hogsheads for shipment, which completes the course of treatment before marketing.

REPORT OF THE CHEMIST

(FRANK T. SHUTT, M.A., F.I.C., F.C.S.)

OTTAWA, 1st December, 1893.

WM. SAUNDERS, Esq.,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith the seventh annual report of the Chemical Department of the Dominion Experimental Farms.

The work of the department is necessarily of a manifold character. That which relates to the answering of correspondents' questions, and the examining and reporting on samples of soil and agricultural products for individuals, although an extremely useful branch of the work, is not repeated here. In the following pages are recorded only the data and conclusions considered to be of general interest and value to the farming community of the Dominion. A brief outline of this matter, prepared for convenience of reference, is as follows:—

SOILS.—Our work on the examination of representative soils has been continued. Interesting data together with conclusions as to the relative fertility and rational treatment of the soils analysed during the past years are here given. The investigation included virgin soils from widely distant points in Canada.

An analysis of every soil received is neither possible nor desirable. A qualitative and physical examination is however made, and a report forwarded to the sender of the sample, with such suggestions as to fertilizers and modes of treatment as are deemed advisable for increased crop yields. The soils so reported on have been received from all parts of the Dominion. In this new departure, I believe, the Chemical Department has been of much benefit to our agriculturists.

ALKALINE SOILS.—In the chapter on alkaline soils, a distinct and progressive step towards their amelioration is recorded. The experiments of the past year have proven that by the treatment here detailed the baneful effects of magnesium sulphate (Epsom salts) in a soil, may be overcome.

The variable character of the alkali in the affected districts, does not allow us to offer any one method whereby all alkaline soils may be alike beneficially treated, unless it be that of thorough drainage. To all those in Manitoba and the North-west Territories possessing "alkali patches," the reading of the present report is commended.

MUCKS, PEATS AND MUDS.—The value of these naturally-occurring fertilizers is stated at some length, and the composition of many samples lately analysed given in tabular form. Suggestions for the economic use of these fertilizers are added.

WOOD ASHES.—Special attention is called to the value of potash in agriculture, and a plea is made for the better recognition of the value of Canadian wood ashes.

LEGUMES.—The results of analyses of several members of the Leguminosæ are inserted together with some remarks upon the value of these plants for fodder and as green manure.

CARROTS.—An interesting investigation was made to ascertain if there were any difference in feeding value between the part of the root developed above ground and the part below the surface of the soil. Our analytical data and conclusions are here given for the benefit of our readers.

THE BABCOCK TEST.—Dairymen will find a record of further experiments with this useful method of ascertaining the percentage of fat in milk. These have special reference to the amount of potassium bichromate to be used in composite testing.

WELL WATERS.—As in former years, the analysis of farmers' well waters is a matter that has received our attention. The results of the past year are given, and attention is drawn to the danger of drinking from a contaminated supply.

SALINE WATERS.—Some experiments towards the improvement of certain saline waters have been made this year. The results are commended to the notice of those who unfortunately have to depend upon such unwholesome supplies.

MISCELLANEOUS.—Several other matters, though perhaps of less importance than the foregoing, are treated of in the following report, since they are considered of general interest to farmers.

Addresses have been delivered at several of the larger agricultural conventions in Ontario, and have received publication in their transactions.

They are as follows:—

Dairymen's Association of Eastern Ontario—Home grown Coarse Fodders.
Creameries' Association of Ontario—Paying for Milk according to Butter-fat.
Ontario Agricultural and Experimental Union—The Chemistry of Farmyard Manure.
Convention of Executive Health Officers, Ontario—The Farm Water Supply.
Ontario Fruit Growers' Association—The Chemistry of the Copper Fungicides.

In addition to these, several Farmers' Institutes were attended and addressed.

In August, upon the nomination of Sir Henry Trueman Wood, Secretary to the Royal Commisson of Great Britain, I was appointed a professional juror on cereals at the World's Columbian Exposition, Chicago.

Accordingly, with the approval of the Honourable the Minister of Agriculture and yourself, I proceeded to Chicago and there assisted in the analysis of more than 500 samples of grain including wheat, oats, barley, rye, Indian corn, buckwheat, rice and flour—among which were many samples from all parts of Canada. The awards for excellence in this department were granted from data derived from physical inspection and chemical analysis—the nutritive value as deduced from the composition of the grain, being an important factor.

In this connection, it is particularly gratifying to note that the analysis of the samples of wheat (principally Red and White Fife) sent from Manitoba and the North-west Territories, showed them to be of excellent quality and containing a very high percentage of albuminoids, thus confirming previous analyses and opinions of the wheat grown in these provinces.

The United States Department of Agriculture purpose publishing in bulletin form the analytical data of all the cereals examined.

In January last Mr. A. Lehmann, B.S.A., resigned his post of assistant chemist to accept a position on the staff of the Experiment station of Louisiana, at New Orleans. For two years and a half Mr. Lehmann had worked faithfully and well in our laboratories, and it was with much regret that I parted with an assistant who had proved himself so valuable and had taken such a deep interest in the chemical work of the Farms.

Mr. P. H. Le Rossignol, B.A.Sc. of McGill University, Montreal, was appointed to the vacant assistantship in April. Mr. Le Rossignol has shown himself a careful and skilful analyst and well qualified for the work of this department. To his ability and industry I am indebted for many of the results here recorded.

I have the honour to be, Sir,

Your obedient servant,

FRANK T. SHUTT,

Chemist, Dominion Experimental Farms.

Chemical Laboratories,
Central Experimental Farm,
Ottawa.

INTERIOR VIEW OF MAIN LABORATORY.

SOILS.

The investigation into the composition of certain Canadian soils has been continued, and the results of the analyses of sixteen samples obtained during the past year are now given.

Since the amount of work involved in soil analysis in very considerable, the chemical examination is restricted to those samples which either represent the virgin soils covering large areas in the Dominion or, on account of supposed barrenness, present themselves as worthy of special examination.

In previous reports (1890 and 1891) the factors upon which the fertility of a soil depends have been enlarged upon, the constituents of soils enumerated, and the limits between which the elements of the plant food vary in soils given. It will only be necessary, therefore, to insert the following abstracts, which afford sufficient information to render intelligible the chemical data in the subjoined table:

Factors of a Soil's Fertility.—"The factors upon which the fertility of the soil depend are many. The amount of plant food and its degree of solubility, the mechanical texture or tilth and the climate (temperature, amount of rainfall, &c.) are the chief of these.

"Soil, to be fertile, must contain the elements of plant food in such forms that they can be readily used for the nutrition of vegetation. At the same time its condition must not be too loose, else a firm hold will not be afforded to the roots of plants, and there will be too much drainage and evaporation; nor must it be too heavy and plastic, for then air and water could not freely permeate it nor the roots extend themselves beyond a very limited area. Generally speaking, light, loose soils are not as rich in plant food as those in which clay predominates; yet, on account of their excellent condition of tilth, they often yield, in favourable seasons, heavier crops than the latter. Stiff, heavy clays, though rich in inorganic plant food (potash and phosphoric acid) are often poor in nitrogen, while their condition is such as to prevent thorough aeration and the penetration of the roots. It is these soils especially that are benefited by drainage. By a system of drainage the water which saturates the surface soil is carried off, air allowed to permeate, the whole rendered more friable and easily worked, and much plant food is converted into assimilable forms.

"Where sand largely preponderates, the soil is not retentive of moisture and fertilizing material, especially if the subsoil be light, and though easily worked, is not so desirable in dry seasons as a heavier soil.

"A proper proportion of sand and clay, therefore, for many reasons, makes the best soil.

"With the clay and sand, varying amounts of peaty matter or humus (derived from the decomposition of vegetable matter), and of calcareous matter (principally carbonate of lime) are usually associated, and a right proportion of the two latter exerts a beneficial influence upon the tilth of a soil. From the presence of these predominating materials, soils are known respectively as clay, sandy, peaty and calcareous, according as one or the other is in excess.

"By the slow decomposition of the clay and the peaty and calcareous matter, plant nutrients are liberated in a soluble form, and therefore the function of these soil fundamentals is not only mechanical but chemical.

The Essential Elements of Plant Food.—"The most important inorganic constituents of a soil are potash and phosphoric acid. These, together with nitrogen, are known as the *essential elements* of plant food.

"*Potash*—derived principally from the decomposition of felspathic rocks, *e.g.*, granite—exists chiefly in combination with silica in a more or less soluble condition. The limits of potash in a soil lie between a mere trace and about 2 per cent. A good agricultural soil contains between ·25 per cent and 1 per cent. Clay soils, usually, are the richest in potash.

"Potash, as a fertilizer, is of special value to clover, pease and other leguminous crops; potatoes, beets, cabbage, grasses and leafy plants in general, are also benefited by it. It should form a large part of manures for orchards and all fruit trees.

"*Phosphoric acid*, combined principally with lime, is found in all fertile soils. Like potash, it has been derived from the rock that originated the soil, and consequently is not constant in quantity. It never exceeds 1 per cent, even in the richest soils, and the average in good soils is about ·2 per cent.

"It benefits chiefly root crops, *e.g.*, turnips and beets, and in conjunction with nitrogenous manures is very effective for the cereals, promoting an early maturity and an increased yield.

"*Lime.*—Of the inorganic elements of minor importance, lime is the principal. It affords food directly to the plant and liberates in the soil potash and nitrogen pre-existent in insoluble forms. Many consider that less than 1 per cent shows a soil to be deficient in lime, and calcareous soils are almost invariably fertile.

"No special mention need here be made of the other mineral constituents, as most soils contain sufficient for all the requirements of farm crops.

"*Nitrogen* is the element of value in the organic portion of a soil. It there exists, for the most part, in forms from which it can be but slowly absorbed by plants. By a process of fermentation, known as nitrification, it is rendered assimilable. The presence of lime (carbonate of lime) appears to assist in this useful operation, especially when the ground is sufficiently open for the air to permeate it. Moisture and warmth are also necessary to encourage the growth of the microscopic ferment which causes the formation of nitrates from nitrogenous material.

"Very rich soils contain from ·5 per cent to 1 per cent of nitrogen; good, fertile soils possess on an average from ·15 per cent to ·25 per cent.

"Nitrogen is essentially the fertilizer for cereals, especially when associated with phosphoric acid. An excess of nitrogen, however, promotes a rank growth of straw."

NORTH-WEST TERRITORIES.

The samples Nos. 1, 2 and 3, were forwarded by Messrs. Osler, Hammond and Nanton, of Winnipeg, Manitoba, who furnish the following information regarding their character:

Speaking of No. 1, they say, "This soil exists in large quantities along the line of railway between Qu'Appelle River and Saskatoon, and is found as a layer between the surface and subsoil, which latter is clay. Wherever this layer is found the grass is thin and rank, and the general appearance of the soil is cold and barren." Locally, the soil is classed alkaline.

Respecting soils Nos. 2 and 3, they quote from a letter written by Mr. Dodd, their inspector, as follows: The sample No. 2 "was taken from the bench west of the arm at Chamberlain (Tp. 22, R. 26, W. 2). There were about 6 inches of surface soil, and 2½ feet of this stuff, perfectly dry. Below this 2½ foot layer was good, sweet clay, and moist. I am satisfied the whole trouble with the land is in this layer. Sample No. 3 is from corner of 2 and 3, 35, 34, Tp. 29, R. 24, W. 2. I fancy it is stronger than the other."

These soils, which from their position must be regarded as subsoils, have in many respects similar characteristics. Air dried, they are almost white, of a very fine texture, and powder easily. They are, essentially, calcareous clays. A mechanical separation of No. 1 proved it to contain but little true sand, though the treatment served to distinguish between fine clay and small agglutinated masses of clay formed by the cementing action of the carbonate of lime present. Nos. 2 and 3 possess fair proportions of sand.

Considered chemically, the following inferences may be made. In potash, while No. 1 is somewhat below the average of good soils, Nos. 2 and 3 contain amounts equal to those in soils of great fertility. The phosphoric acid in all is low, but many soils of an equally small percentage have borne abundant crops. As might be expected in a subsoil, the percentage of nitrogen is not high, though in this

ANALYSES OF SOILS (air-dried), 1893.

Number.	Soil.	Locality.	Water.	Organic and Volatile Matter.	Clay and Sand.	Oxide of Iron and Alumina.	Lime.	Magnesia.	Potash.	Soda.	Phosphoric Acid.	Soluble Silica.	Carbonic Acid (undetermined.)	Total.	Nitrogen.	Clay.	Sand.
1	Subsoil	Between Qu'Appelle and Saskatoon, N.W.T.	3·11	6·32	54·95	9·52	14·34	·57	·10	·45	·10	·10	10·40	100·00	·128	....	......
2	"	Tp. 22, R. 26, W. 2. .... "	3·12	6·23	60·44	6·69	11·90	2·74	·47	·10	·12	·10	8·09	100·00	·120	33.19	27·25
3	"	2 and 3, 34, 35, Tp. 29, R. 24, W. 2. "	3·67	8·25	44·55	4·97	19·29	4·24	·44	·11	·11	·09	14·28	100·00	·092	32·83	11·72
4	"	Chilliwack, B.C....	1·74	6·66	71·52	14·32	1·49	2·61	·15	·54	·13	·19	·65	100·00	·128	69·58	1·94
5	Surface	Squamish Valley, B.C.....	1·50	3·33	81·98	8·59	1·66	1·62	·38	·33	·20	·21	·20	100·00	·087	37·56	44·42
6	"	Alberni "	5·31	10·22	53·46	26·45	1·08	2·78	·31	·12	·08	·72	.....	100·53	·120	53·46	......
7	"	First Bench, Exp. Farm, Agassiz, B.C	3·15	6·65	77·86	9·67	·84	1·19	·31	·14	·23	·07	.....	100·11	·154	28·46	49·40
8	"	Second " " "	2·34	4·24	79·42	10·89	·77	1·12	·34	·15	·13	·19	·41	100·00	·099	41·21	38·21
9	"	Orchard " "	3·42	6·69	74·97	11·08	·93	1·52	·38	·15	·18	·20	·48	100·00	·149	40·53	34·44
10	"	" "	3·24	6·96	75·14	10·83	·94	1·48	·33	·17	·25	·20	·46	100·00	·148	38·79	36·35
11	"	Lot 28, Con. 1, Tp. Perry, Muskoka, Ont...	5·33	8·90	78·91	6·13	·08	·14	·04	....	·17	·05	·25	100·00	280	20·50	58·41
12	Subsoil	" " " ...	3·75	4·91	84·19	6·28	·13	·26	·06	....	·17	·07	·18	100·00	·114	28·52	55·67
13	Surface	St. Clet, P. Quebec......	3·25	7·51	77·65	9·32	·45	1·07	·37	....	·32	·22	.....	100·16	·191	17·73	59·92
14	Subsoil	" "	3·66	3·53	76·61	12·47	·70	1·79	·45	....	·29	·27	·23	100·00	·047	10·54	65.07
15	Surface	St. Ignace du Nominingue, P. Quebec ...	3·22	5·58	79·00	8·84	1·19	1·11	·11	·44	·18	·02	·31	100·00	·174	69·97	9·03
16	Subsoil	" " " ...	3·21	5·44	79·39	8·26	1·13	1·48	·10	·46	·18	·01	·34	100·00	·166	71·50	7·85

constituent they compare very favourably with ordinary subsoils. It is to be especially noted that they contain a high percentage of carbonate of lime.

For subsoils, therefore, they cannot be considered deficient in the essential elements of plant food.

A careful examination was then made for the presence of any deleterious alkali. The following are our results:—

	No. 1.	No. 2.	No. 3.
Total water-soluble content.	·307	·072	·167
which on analysis was found to contain			
Soda (Na_2O)..	·04	—	trace
Potash (K_2O)................................	·01	trace	—
Lime (CaO)..	trace	"	trace
Magnesia (MgO).	"	"	"
Sulphuric acid (SO_3)........................	·03	none	none

It is very evident from the above results that these are not alkaline soils, since the amounts of alkaline salts here found are well within the limits of those in good, arable soils. I conclude, therefore, that these soils do not contain any compound deleterious to vegetation.

It has already been mentioned that tilth or mechanical texture of soils is an important factor in soil fertility. From the nature of these samples, I am led to believe that the apparent barrenness is due to physical rather than to chemical causes. Calcareous soils, such as these, are extremely absorbent. Though they are capable of holding a considerable amount of water, they yield this water with difficulty to the roots of growing crops. It is also a characteristic of this class of soils that they generally appear dry, in spite of the fact that they may contain a very fair percentage of moisture.

These soils are from districts which enjoy a very limited rainfall; it is therefore possible that their barrenness may be in part, if not wholly, due to the absorption and retention of much of this small quantity of rain.

If the overlying surface soil is sufficiently deep and fairly rich in nitrogen, and the climatic conditions (rainfall, &c.) are favourable, there would appear to be no reason why remunerative crops could not be raised upon these soils. The alleged barrenness points to a too shallow or too poor surface soil, to an unsuitable tilth or an insufficient rainfall or other unfavourable climatic condition.

BRITISH COLUMBIA.

No. 4.—Soil from Chilliwack, B.C. This consisted of samples of the upper and lower layers of the surface soil and of the subsoil. It is reported by Mr. Chapman of Chilliwack, who forwarded the samples, that they are representative of an area of about 4,000 acres, all taken up with homesteads of 160 acres each. The tract lies between the mountain range and the Fraser River. Numerous streams flow from the mountain. These, on reaching the base, have no regular channels, and in consequence spread over the surface of the land, finally collecting into a sluggish stream which flows into the Fraser River. Mr. Chapman writes that a drainage scheme is now in progress to reclaim this large area of land. He reports that good yields of the cereals are obtained, though there is a tendency to lodge. Roots and vegetables also, with a few exceptions, do very well.

The specimens of the upper and lower layers of the surface soil—which varies in depth from 2 feet to 4 feet—are peaty in character, reducing easily in the air-dried condition to a deep brown powder. They were submitted to a partial analysis, with the following results:—

ANALYSIS of Air-dried Surface Soil.

Constituents.	Upper layer.	Lower layer.
Moisture	9·37	8·61
Organic and volatile matter	79·14	80·57
Insoluble residue, clay and sand	4·54	3·66
Mineral matter soluble in acid	6·95	7·16
	100·00	100·00
Nitrogen, in organic matter	3·51	3·51

The surface soil is therefore exceedingly rich in organic matter and nitrogen. With a proper admixture of sand and clay, a soil would result, that in tilth and fertility would equal the most productive lands of the Dominion. Good drainage, a certain mixture of the subsoil and an occasional application of wood ashes and lime or marl, are all that is necessary to ensure abundant crops, providing that climatic influences are favourable.

The subsoil (No. 4) is heavy clay, possessing very little sand. Its potash and phosphoric acid are in fair amounts. For a subsoil, its nitrogen may be termed high. In lime it is somewhat deficient. A peculiarity to be noted is the large percentage of oxide of iron and alumina it contains.

No. 5 is a surface soil from the Squamish Valley in the district of New Westminster. "The valley is said to have an area of 14,000 acres. The only drainage at present is the natural one by rivers and creeks. The surface soil has an average depth of fifteen inches, the sample for analysis being representative of the first six inches. The underlying subsoil is of clay, though occasionally running into sand."

Though fairly rich in mineral constituents this soil is poor in humus and nitrogen. To improve it chemically and physically, heavy dressings of barnyard manure are necessary. An alternate method, and perhaps under the circumstances a more economical one, would be to turn under some green crop, preferably, clover or pease, which should be ploughed in while the plants are in flower. Such a treatment would not only add nitrogen in an available form, but improve the tilth and absorbent character of the soil.

No. 6 is a specimen of surface soil from Alberni, Island of Vancouver. The sample represents the soil to a depth of ten inches from an approximate area of 10,000 acres. The depth of the surface soil varies from a few inches to about four feet. The subsoil is variable, sometimes clay, sometimes sand and gravel. The soil is of a deep red colour, due to the presence of a large percentage of oxide of iron. It is essentially clay.

From the analysis I judge it to be a soil of fair quality. Of the important constituents, it is rich in potash—which might be expected from its origin—poor in phosphoric acid and of medium richness as regards nitrogen. To improve it in this latter respect, liberal application of barnyard manure or the turning under of several crops of growing clover or pease would be advantageous. Nitrate of soda or sulphate of ammonia applied in the spring would also give excellent results. Since these latter fertilizers are costly, their economic use can only be determined after several years of trial with varying quantities. It is always the safest practice, before applying more extensively these concentrated fertilizers, to asertain on small areas the amount that gives the best results. Fish waste is also to be highly recommended as a valuable manure for these soils.

To furnish phosphoric acid, superphosphate of lime or ground bones may be used. The former gives more immediate results, while the effect of the latter is more lasting in the soil.

The addition of composted muck, if such is procurable, is to be recommended for improvement of tilth and enrichment of the soil in plant food.

Numbers 7, 8, 9 and 10 are samples of surface soil from the Experimental Farm at Agassiz. Like the other British Columbia soils examined, they may be classed as of medium quality. In tilth they are rather light, though possessing a fair amount of clay. In potash they are all slightly above the average. With the exception of No. 8 (from the second bench), they are very similar as regards nitrogen and phosphoric acid, containing what may be regarded as amounts equal to those in average fertile soils. The data prove the soil from the first bench (No. 7) to be a little richer in nitrogen than the others. Nos. 9 and 10, from the valley, are almost identical in all essential particulars. All these samples are to be considered as somewhat deficient in lime, one per cent being the lowest limit placed by many authorities for the best results.

PROVINCE OF ONTARIO.

Nos. 11 and 12 are surface soil and subsoil from the district of Parry Sound, and constitute members in a series of soils from Muskoka that are being examined in our laboratories.

The results of the analyses of the first five samples in the series are detailed in my report for 1891. These soils were obtained with great care by Mr. G. S. Wilgress, B.A., Barrister at Huntsville, who assures me that they are thoroughly representative of the districts from which they were obtained.

The specimens were procured from Lot 28, Concession 1, Township Perry. "The surface of the land is level or gently sloping, there being no rocky bluffs. The soil is somewhat stony and light in character, producing before cultivation much excellent hardwood, *e. g.*, maple, beech, birch and ironwood. The field from which the samples were taken was in summer fallow. It had never been manured, but had grown a splendid crop of oats the year before."

Both surface soil and subsoil are light in character, sand predominating. In this respect they are similar to the Muskoka soils already reported upon. As regards the important and valuable constituent, nitrogen, the surface soil is considerably above the average (·280 per cent), while the subsoil contains a very fair percentage. In potash, they are very low. In phosphoric acid they are close to the average found in soils of this character. In lime they are particularly deficient.

In favourable seasons, when the rainfall is ample, this soil will undoubtedly yield good crops, though somewhat too light for the best results with cereals. An admixture with clay, if such is possible, and the occasional ploughing under of a green crop, would, I consider, prove of much benefit. It is a warm soil and one that would respond readily to manures; at the same time it is one that would leach easily (more especially as the subsoil is sandy), and therefore requires frequent applications of manure rather than larger quantities at longer intervals. To supply potash and lime, wood ashes and marl are to be recommended. For fruit trees and root crops, such an application will be found of great benefit.

PROVINCE OF QUEBEC.

The soil and subsoil Nos. 13 and 14 are from St. Clet, Soulanges. The surface soil is a dark gray sandy loam. It is somewhat lighter in character than betokens the best tilth. It is a warm soil, permeable to water and air, and, though a *responsive* soil, is one that easily leaches. In all the essential elements of plant food this soil may be placed with those of ordinary fertility.

To increase its percentage of nitrogen and at the same time improve its tilth, the ploughing under of green crops (as before recommended) is advisable. When applying farmyard manure to soils of this character, it is usually a good practice to spread the well rotted manure immediately before the spring ploughing. A dressing of marl, plaster or lime would prove of benefit to most crops grown on this soil, as the latter is somewhat deficient in calcareous matter.

Samples Nos. 15 and 16 are from St. Ignace du Nomininque, Ottawa Co., and represent the character of much of the soil and subsoil on the Lièvre River. Very

little difference, either chemically or physically, is to be noticed between the surface and the underlying soil. They are clay loams, of a gray colour and somewhat heavy in texture. To mellow the surface soil (No. 15) drainage is necessary; by this means the tilth would be much improved. It is a retentive and strong soil, being more especially adapted to the growth of cereals. Respecting its elements of plant food, it may be regarded as of average fertility, though in potash the percentage is low. Marl, muck and wood ashes are natural fertilizers the application of which would yield good returns. Barnyard manure, which might be ploughed under green, in addition to thorough drainage, would make this an excellent soil.

ALKALINE SOILS.

The investigation into the character of these soils with a view to their amelioration was commenced nearly two years ago. In our report for 1891 analyses are to be found of three specimens of soils impregnated with "alkali." The data showed that sulphate of magnesium (Epsom salts), and not sulphate or carbonate of sodium (the usual forms of alkali), was in all probability the cause of the barrenness of the soil. The following suggestions were then made for the improvement of these soils:—

"As the alkali is soluble in water, a thorough drainage system should be resorted to wherever practicable. I am firmly of the belief that this would be the most efficacious method of getting rid of the poisonous material. Deep ploughing should be practised. Thorough tillage prevents surface evaporation and the accumulation of alkali near the surface. A heavy dressing of barnyard manure, animal refuse or other highly nitrogenous organic matter, is said by many to materially improve these alkali patches, inducing a vigorous growth. Again, by others gypsum is strongly recommended. Where the alkali is carbonate of soda, gypsum is beneficial in converting this caustic salt into one less deleterious to vegetation."

Since that date further analyses of alkaline soils have been made. Laboratory experiments also have been instituted which had for their object the rendering inert to vegetation the corrosive or poisonous material in the soil. The results obtained by the analyses of four samples during the past year are as follows:—

ANALYSIS of Water-soluble Contents of Air-dried Alkaline Soils.

Locality.	Total water-soluble, contents, dried at 110° C.	Soda (Na_2O).	Potash. (K_2O).	Lime.	Magnesia.	Sulphuric acid (SO_3).	Chlorine.	Total Nitrogen in soil.
Near Oak Point, Manitoba.......	24·010	6·29	....	·27	2·42	10·66	2·42	·245
" "	2·263	·512	....	·13	·31	·56	·62	·441
Near Binscarth "	5·355	1·55	·01	·38	·32	3·00	·06	·558
From a few miles north of Brandon	4·855	·38	·02	·53	·97	2·64	·27	·660

The theoretical combination of these constituents may be stated as follows:—

No. 1.—Near Oak Point—

	Per cent.
Magnesium sulphate (Epsom salts)..........................	14·88
Sodium sulphate (Glauber's salt)..........................	9·65
" chloride (common salt)	3·93
Calcium sulphate (gypsum)..........................	·83

No. 2.—Near Oak Point—

Magnesium sulphate (Epsom salts)..........................	1·72
" chloride..........................	·15
Sodium chloride..........................	·94
Calcium carbonate (carbonate of lime)..........................	·23

No. 3.—Near Binscarth—	
Magnesium sulphate (Epsom salts)	1·97
Sodium sulphate (Glauber's salt)	3·46
" chloride (common salt)	·07
Potassium chloride	·01
Calcium sulphate (gypsum)	·89
Calcium carbonate	·15
No. 4.—From North of Brandon—	
Magnesium sulphate (Epsom salts)	5·96
Sodium sulphate (Glauber's salt)	·355
" chloride	·42
Potassium chloride	·03
Calcium sulphate (gypsum)	1·07
" carbonate	·325

It is to be inferred from the foregoing that not only the total amount, but also the composition of the alkali in the soils, is extremely variable. Though in all the the four specimens, magnesium sulphate is present in large amounts, and notably so in Nos. 1 and 4, sodium sulphate (also deleterious to vegetation) exists in considerable percentages in Nos. 1 and 3. The proportion of magnesium sulphate to sodium sulphate and other soluble alkali is by no means constant.

These soils were of the deep black type, so well known in Manitoba, and contained large percentages of the valuable element, nitrogen. They would undoubtedly prove exceedingly fertile if freed from alkali.

In 1892 several series of pot experiments were carried on with wheat, pease and Indian corn in soils impregnated (*a*) with magnesium sulphate, (*b*) with magnesium sulphate mixed with carbonate of lime (chalk), and (*c*) with magnesium sulphate and lime. Many of the results obtained, together with illustrations showing the growth of the plants under these circumstances, are to be found in my evidence before the "Select Standing Committee of the House of Commons on Agriculture and Colonization" for 1893. It will therefore only be necessary here to give a summary of the conclusions then reached.

In soils to which 5 per cent of magnesium sulphate (Epsom salts) had been added, the germination of the seeds was always greatly retarded. Many of the seeds sown never produced plants that appeared above the surface of the ground, while those which came up lacked robustness, made but little growth and then died. All the experiments proved that magnesium sulphate to the extent of 5 per cent in the soil is most disastrous to plant life.

In another series, sufficient carbonate of lime, in the form of powdered chalk, was mixed with the soil to theoretically convert after the lapse of time the 5 per cent of magnesium sulphate into an inert and insoluble compound. In these pots germination was also delayed, though not so long as in the former series, and a greater percentage of plants grew, though their development was not equal in vigour or luxuriance to those in the potting soil. To a certain extent carbonate of lime had counteracted the deleterious effects of the magnesium sulphate.

Further experiments were then commenced in which lime was substituted for carbonate of lime in the soil containing the 5 per cent of magnesium sulphate. The reaction of the lime in rendering the magnesium salt insoluble would be quicker, and better results were therefore expected, than in the foregoing series. This prediction proved correct. Though germination was somewhat retarded, a greater percentage of plants grew and attained a larger and healthier growth than in the soil containing the antidote, carbonate of lime. It was evident that the lime proved the more efficacious of the two.

This latter series of experiments has been repeated this year, and the results are now given in graphic form. They are in accord with those of last year and show quite distinctly that soils containing magnesium sulphate as the only form of alkali may be effectually treated by a dressing of lime. The growth of the wheat, pease and Indian corn plants under the several circumstances of the experiments is well depicted on the accompanying diagrams.

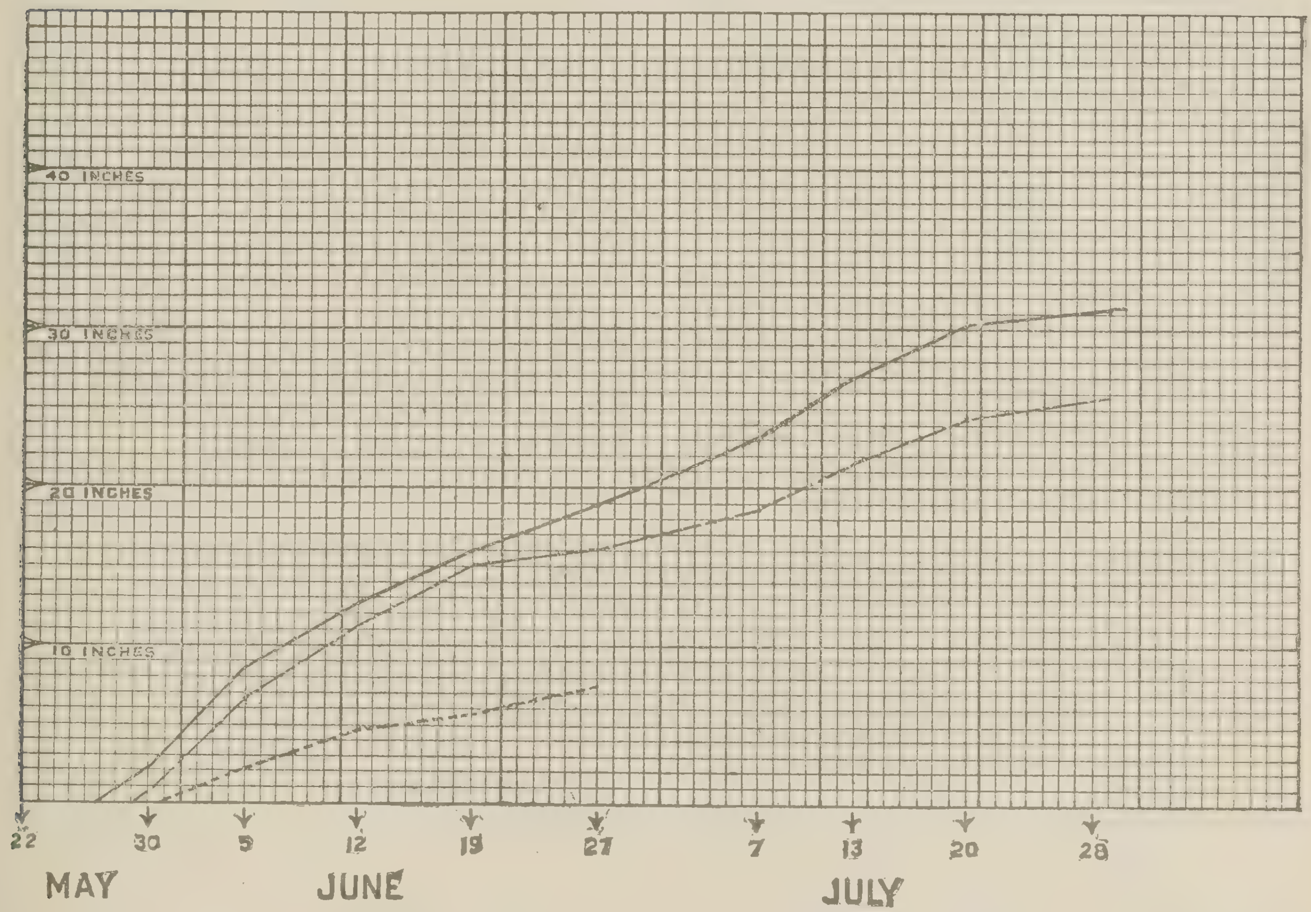
The experiments began May 28th and ended July 28th, 1893.

DIAGRAM SHOWING AVERAGE GROWTH OF WHEAT PLANTS.

Continuous line—Plants in potting soil.

Broken line—Plants in soil + 5 % $MgSO_4$ + excess of CaO.

Dotted line—Plants in soil + 5 % $MgSO_4$.



WHEAT.—Seed planted May 22nd. Experiment ended July 28th.

The average growth of the wheat plants at the close of the experiments (as denoted by the heights attained) in potting soil was 31 inches.

In the pots containing the 5 per cent of magnesium sulphate, it was $7\frac{1}{2}$ inches on June 27th, when the plants died.

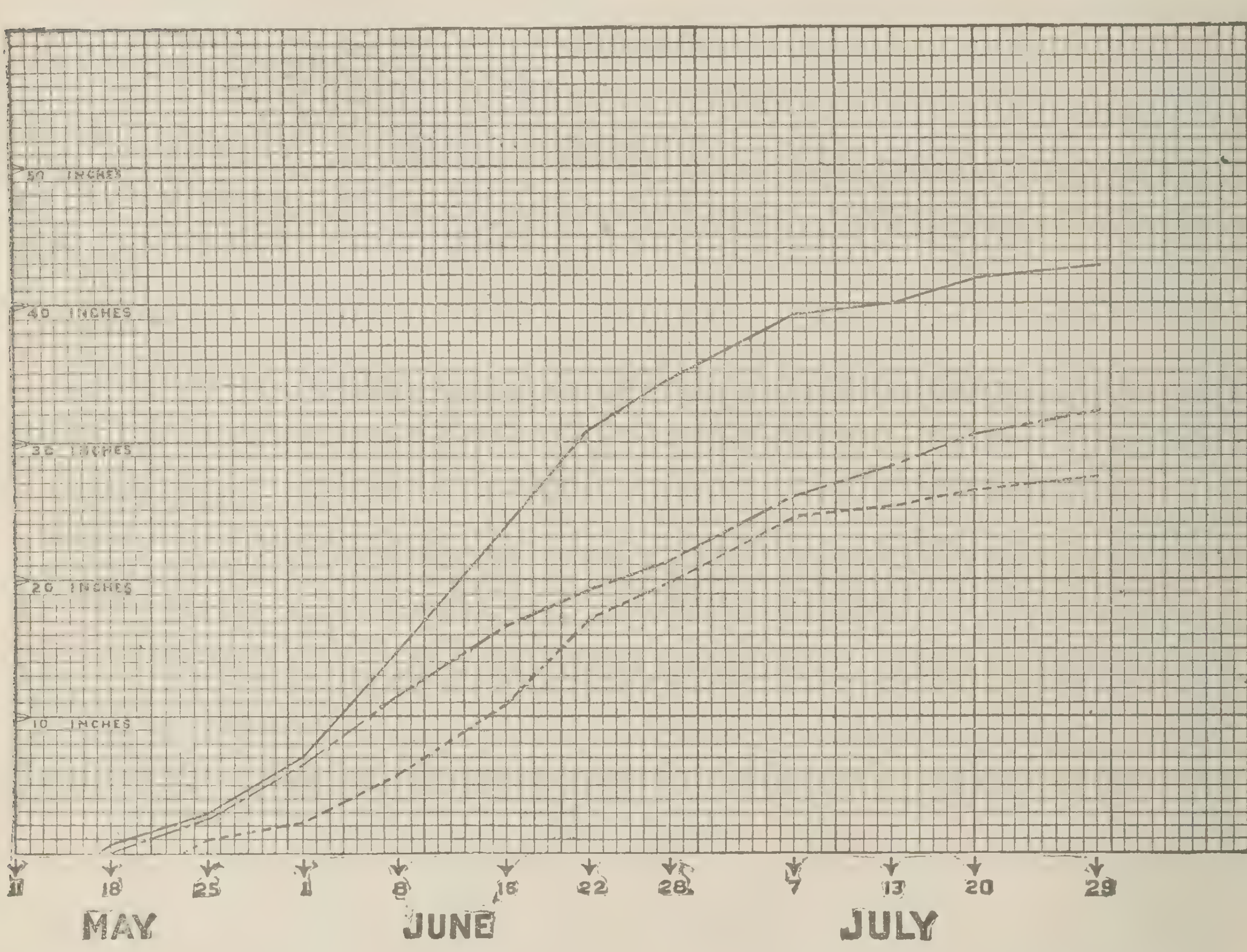
In the soil containing the lime in addition to the magnesium sulphate the growth was $25\frac{1}{2}$ inches when the final measurements were made.

DIAGRAM SHOWING AVERAGE GROWTH OF INDIAN CORN PLANTS.

Continuous line—Plants in potting soil.

Broken line—Plants in soil + 5 % $MgSO_4$ + excess of CaO.

Dotted line—Plants in soil + 5 % $MgSO_4$.



Indian Corn.—Seed planted May 11th. Experiment ended July 29th.

The average growth as indicated by the heights of the plants is as follows:

In good potting soil, 42½ inches.

In soil containing 5 per cent of magnesium sulphate, 27½ inches.

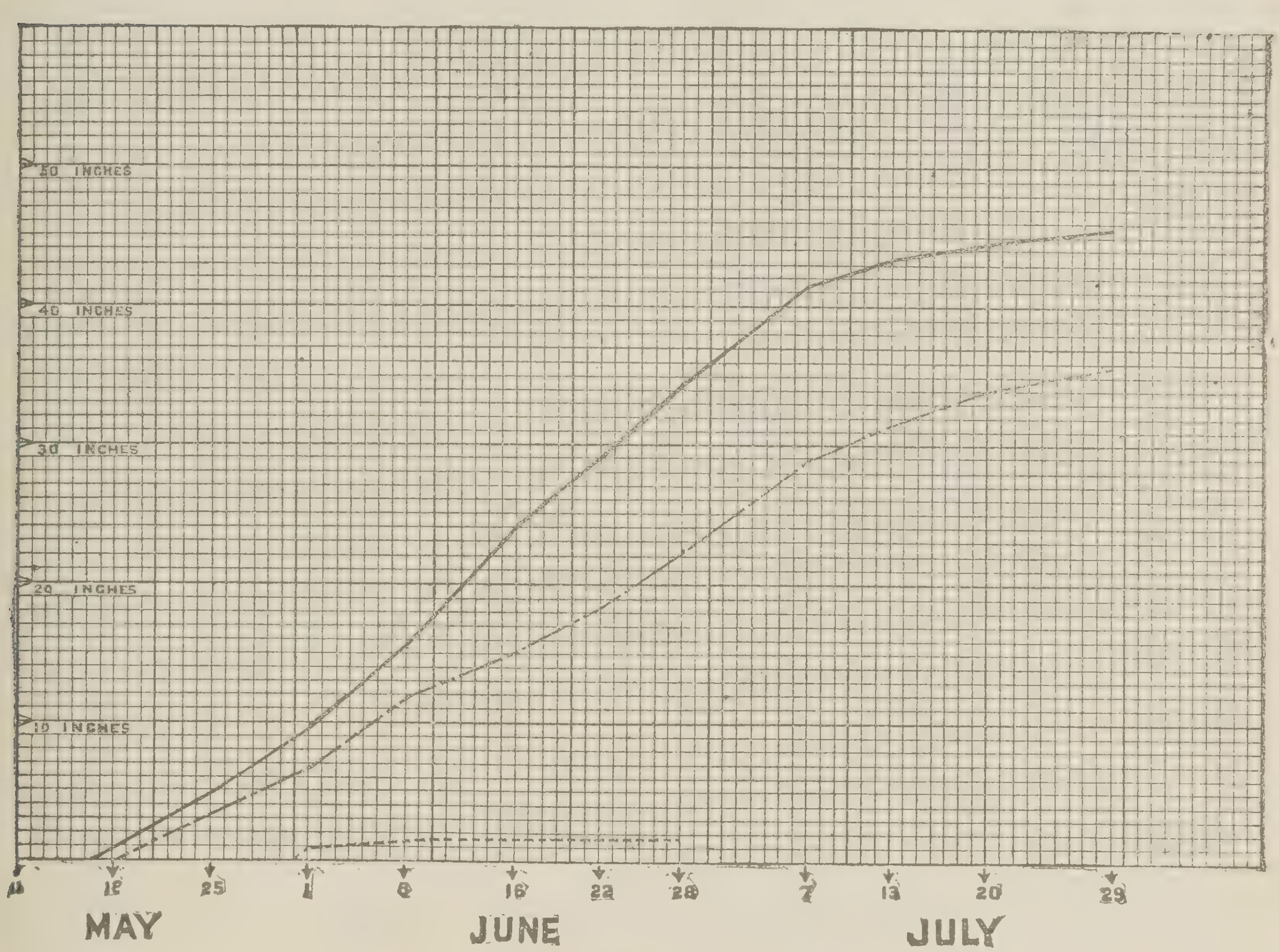
In the soil containing both the magnesium sulphate and lime, 32 inches.

DIAGRAM SHOWING AVERAGE GROWTH OF PEA PLANTS.

Continuous line—Plants in potting soil.

Broken line—Plants in soil + 5 % $MgSO_4$ + excess of CaO.

Dotted line—Plants in soil + 5% $MgSO_4$.



PEASE.—Seed planted May 11th. Experiment ended July 29th.

The average growth in potting soil was $45\frac{1}{2}$ inches at the close of the experiment.

In the soil containing 5 per cent of magnesium sulphate $1\frac{1}{2}$ inches only on May 28th, when the plant died.

In the soil containing both magnesium sulphate and lime the average height was $35\frac{1}{2}$ inches.

The reaction between the magnesium sulphate and the lime would naturally proceed with time, and succeeding seasons would no doubt show better and better results on this treated soil. It would appear, therefore, that soils barren from the presence of this salt, may by the simple method of treatment with lime here suggested, be brought into a state of fertility.

Where a large portion of the saline matter is sodium sulphate, the treatment with lime would first result in the formation of corrosive soda and then of sodium carbonate. This would finally be converted into sodium sulphate. Although much slower in its action, carbonate of lime would here prove beneficial, since it would render the magnesium salt insoluble without reacting upon the sodium compound. An application of a mixture of gypsum and lime in such a case might also be of benefit—the former having the tendency to keep the sodium salt as sulphate—the latter converting the magnesium salt into an insoluble form. This treatment should be carried out in conjunction with drainage, which must always be resorted to wherever practicable. For soils impregnated with alkali in which sodium sulphate largely predominates, drainage, deep ploughing, thorough cultivation and high manuring are the only remedies that can now be recommended with confidence.

MUCK, LEAF-MOULD, PEAT.

Of all the constituents of plant food taken from the soil by growing crops, there are but three that it is generally necessary to return, viz., nitrogen, phosphoric acid and potash, and repeated experiments the world over have proved that the fertility of the farm soil can only be maintained by such a return. Without it the land becomes, by successive croppings, less and less productive.

Where mixed farming is in vogue, ordinary well preserved barnyard manure is no doubt the most economical form in which to supply these elements, since by this means nearly 80 per cent of the plant food taken from the soil is replaced. From various causes, however, it often occurs that the supply is inadequate and must be supplemented from outside sources. Leaving out of consideration for the present the question of phosphoric acid and potash, we may discuss briefly the sources from which available nitrogen may be obtained, other than that already mentioned. These fall into three classes :

1. Artificial Fertilizers, such as nitrate of soda and sulphate of ammonia. These present nitrogen to the rootlets of plants in an exceedingly soluble form. They are, moreover, concentrated fertilizers, since weight for weight they possess a much larger proportion of this element than other nitrogenous manures. Their cost, however, mitigates against their general use and necessitates, for their economical application, a considerable amount of skill and experimenting on the part of the farmer.

2. Green Manures.—This method consists in ploughing under a growing crop, preferably of clover, pease or some other of the leguminous plants. These plants are known as nitrogen-collectors in contradistinction to others which are nitrogen-consumers. They are able to appropriate and assimilate nitrogen from the atmosphere, which when the plants are turned in is preserved in the soil for the growth of succeeding crops. For light sandy soils, poor in organic matter and nitrogen, this method of manuring can be highly recommended. It is economical, since it is both cheap and effective, improving the tilth and adding to the store of fertility.

3. Muck, Leaf-mould and Peat. These consist largely of semi-decomposed vegetable matter and contain a considerable, though variable, amount of nitrogen. This nitrogen is not so readily available as in the two classes of nitrogenous manures we have just considered, but by fermentation of the material it may be converted into assimilable forms. The value of a muck or similar material depends chiefly therefore on its percentage of nitrogen. By a suitable treatment of the air-dried muck or peat, many farmers of Canada may obtain at little cost a manure not only rich in the valuable element nitrogen, but also containing notable quantities of other plant food constituents. All fertile soils possess high percentages of organic matter. This,

besides yielding nitrogen, liberates in the soil by its decomposition carbonic acid. This latter undoubtedly exerts a beneficial action in setting free mineral plant food. It is therefore apparent that green manuring or an application of composted muck serves many useful purposes in the soil. Besides acting chemically, such materials serve to mellow heavy soils by rendering them porous and permeable to the air, while sandy and light soils have their retentive and absorbent qualities increased. We may briefly discuss the different ways in which muck and peat may be treated before being applied to the land.

The air-dried substance is extremely absorbent and capable of soaking up and retaining large quantities of liquid manure. Its use for bedding stock and for spreading in the barnyard is therefore apparent. By a plentiful application, much valuable fertilizing material that would otherwise go to waste is saved. The stable manure not only has its good qualities preserved, but by the ensuing fermentation the nitrogen of the muck is rendered available. When it is properly preserved and fermented, there results a quick acting and forcing manure.

Without its previous use as an absorbent, the air-dried muck may be composted. Alternate layers of say 6 inches of barnyard manure and muck make an excellent compost. The whole should be kept moist, though not too wet, and the heap occasionally forked over. If sufficient manure is not obtainable, wood ashes and lime may be substituted. Such a compost would be poorer in nitrogen, but richer in potash than the one just described. To the compost heap should be added all bones, carcasses of dead animals and garbage that accrue on the farm. A compost heap not only serves to keep clean and healthy the surroundings of the farmhouse and buildings, but preserves as in a bank from which withdrawals can easily be made and in which good interest is given, much plant food that would otherwise go to waste. Every farm should have a compost heap, conveniently located. If there is not a deposit of muck in the neighbourhood which can be drawn from, the best soil obtainable should be used. Our table shows the composition of 34 different samples of muck, from all parts of Canada, examined during the past year. They vary much in quality, their value as a rule being dependent upon the amount of nitrogen contained; the condition of decay is also an important factor when considering their availability.

ANALYSES OF MUCKS (air-dried), 1893.

Number.	Nature of Material.	Locality.	Sender.	Nitrogen.	Organic and Volatile Matter.	Sand and Clay.	Mineral Matter soluble in Acid.	Water.	Pounds of Nitrogen in one ton of the air-dried material.
1	Swamp muck.	Summerside.... P.E.I.	W. T. Hunt.......	1·280	52·58	24·05	13·68	9·69	25·6
2	" ..	Montague Bridge "	Geo. D. Campbell.	3·077	71·91	12·83	5·23	10·03	61·5
3	" ..	Baldwin's Road. "	Micipsa Moar......	2·135	72·88	6·02	10·27	10·83	42·7
4	" ..	" .. "	"	2·135	77·48	8·52	4·95	9·05	42·7
5	" ..	" .. "	"	2·145	60·92	24·26	7·09	7·73	42·9
6	" ..	Murray Harbour, South......... "	A. D. McDonald...	2·355	61·33	23·25	6·39	9·03	47·1
7	" ..	Summerside..... "	H. E. Wright......	1·096	33·63	44·04	15·85	6·48	21·9
8	" ..	" ..... "	"	2·143	58·88	15·43	14·26	11·43	42·8
9	" ..	Kildare, lot 4... "	Thos. Cahill.......	1·170	54·49	9·41	3·76	32·34	23·4
10	" ..	" ... "	"	1·079	68·26	12·60	2·75	16·39	21·6
11	" ..	Sturgeon, King's Co.. .... "	John Jamieson.....	·559	68·33	·81	1·25	29·61	11·1
12	" ..	Braedalbane .... "	A. Matheson.......	·968	32·46	48·69	10·30	8·55	19·3
13	" ..	Grove's Point.... N.S.	J. W. Edwards....	1·820	78·99	1·49	6·67	12·85	36·4
14	" ..	" ..... "	" ...	1·410	38·40	42·98	12·39	6·23	28·2
15	" ..	" ..... "	"	·153	5·87	79·95	12·95	1·23	3·1
16	" ..	Amherst. .... "	Geo. Freeman......	1·683	81·59	2·69	7·68	8·04	33·6
17	" ..	Little Bras d'Or, C.B. .... "	Abner Rice........	·692	31·26	47·90	7·46	13·38	13·8
18	" ..	Harrisville...... N.B.	Eli Harris.........	1·215	65·03	1·50	14·83	18·64	24·3
19	" ..	St. John......... "	A. C. Fairweather..	1·680	44·17	40·13	7·24	8·46	33·6
20	" ..	Norton Station.. "	W. H. Baxter......	1·181	78·66	11·89	5·43	4·02	23·6
21	" ..	Shediac...... .. "	Jas. Mugridge.....	2·151	69·30	10·28	10·36	10·06	43·0
22	" ..	Rockville..... .. "	Percy G. Mills.....	1·808	61·62	15·71	16·68	5·99	36·1
23	" ..	Hampton........ "	Wm. McQuarrie....	1·570	65·97	3·67	11·46	18·90	31·4
24	" ..	Bishop's Crossing, Que.	O. M. Bishop	1·745	77·04	1·93	9·47	11·56	34·9
25	" ..	Sutton.......... "	L. E. Dyer........	1·975	59·83	10·41	9·33	20·43	39·5
26	" .	Orono. .... Ont.	F. L. Squair.......	1·790	58·41	8·06	15·98	17·55	35·8
27	" ..	Newcastle.. .... "	W. H. Gibson......	2·000	72·93	2·29	13·47	11·31	40·0
28	" ..	" .... "	"	1·845	62·95	6·53	22·06	8·46	36·9
29	" ..	Hazeldean ...... "	Henry A. Allen....	1·141	26·12	48·78	11·04	14·06	22·8
30	" ..	Colborne........ "	J. K. Fuller......	2·261	59·61	12·13	12·99	15·72	45·2
31	" ..	" .... "	"	2·280	64·34	6·84	12·94	15·88	45·6
32	" ..	Victoria......... B.C.	A. Mowat.........	2·235	66·02	6·27	4·16	23·55	44·7
33	" ..	Chilliwack....... "	Jas. W. Chapman..	3·508	80·57	3·66	7·16	8·61	70·1
34	" ..	" ...... "	" ..	3·510	79·14	4·54	6·95	9·37	70·2

The average number of pounds of nitrogen as found in the various provinces are as follows:—

	Lbs. per ton.
Prince Edward Island..	33·5
Nova Scotia..	28·0
New Brunswick...	32·0
Quebec...	37·2
Ontario..	37·7
British Columbia...	57·4
General average of all the provinces............................	37·6

"MUDS" FROM THE MARITIME PROVINCES.

The deposits formed by tides, or found in the beds of lakes and rivers are known as "muds." From their origin the latter might be designated silt. The composition of "muds" is extremely variable and dependent upon their origin. They consist largely of ground up rock matter, clay and sand, together with shells (more or

less broken up) and organic debris (the remains of plants and animals), in variable quantities. Frequently their chief value lies in the carbonate of lime they contain and which has been derived from shells—usually those of mussels or oysters. Some specimens possess notable percentages of nitrogen, phosphoric acid and potash. In organic matter and nitrogen, however, they never approach the richness of swamp muck.

These muds have been largely used in the Maritime Provinces as a fertilizer, and good results as a rule have followed the first applications. It has been the experience of many, however, that the beneficial effects are not lasting and that after a few years there is but little response from a repeated dressing when applied as the sole manure. This is not to be wondered at, since these muds are not complete fertilizers and cannot furnish all the plant food in the proportions required by farm crops. To a certain extent they supply the elements of fertility and also act on many soils as stimulants, but they must not be considered as concentrated manures, nor should they be used exclusively. As far as possible, they should be supplemented with more assimilable and stronger manures. Barnyard manure, superphosphate and wood ashes are probably the easiest to obtain and the cheapest for use with these muds.

The fine mechanical condition of many "muds" may have made them useful in improving the tilth of certain soils, but instances have come to my notice in which the tilth has been injured by an over application. For the improvement of such soils I would recommend the ploughing under of green crops, preferably clover or pease. This green manuring would not only mellow the soil, but would also enrich it in organic matter and nitrogen.

ANALYSES of air-dried Muds.

Number.	Locality.	Forwarded by	Nitrogen.	Moisture.	Organic and Volatile Matter.	Insoluble residue (clay and sand.)	Residue soluble in Acid.
1	Tatamagouche, N. S.	J. A. C. Campbell	·730	6·00	28·72	51·35	13·93
2	"	"	·304	2·85	11·44	68·35	17·36
3	Waterville, N. B.	A. E. Plumer	·729	2·49	19·80	1·37	76·34
4	Mabou, N. S.	H. Cameron, M.P.	·014	·44	1·45	39·96	58·15
5	"	"	·020	·38	2.23	18·23	79·16

Nos. 1 and 3 contain very fair percentages of nitrogen. No. 2 is much of the nature of a good soil. The lake mud from Walkerville, N.B. (No. 3), consists largely of carbonate of lime, derived from shells. In all essential particulars it may be considered a marl. The samples from Mabou (Nos. 4 and 5) possess large percentages of carbonate of lime, but are poor in other constituents. They would only prove of service to soils requiring lime.

Complete analyses were made of river and mussel mud from Shediac, N.B. The data are as follows:—

ANALYSES of "Muds."

Constituents.	River Mud.	Mussel Mud.
Moisture	2·23	1·72
Organic and volatile matter	13·18	10·52
Insoluble matter, sand and clay	67·68	37·51
Oxide of iron and alumina	12.59	9·08
Lime (CaO)	·48	21·64
Magnesia (MgO)	1·50	1·13
Potash (K_2O)	·23	·13
Soda (Na_2O)	1·28	1·70
Silica (SiO_2)	·04	·07
Phosphoric acid (P_2O_5)	·14	·13
Carbonic acid, &c., undetermined	·65	16·37
	100·00	100·00
Nitrogen	·409	·294

As regards potash and phosphoric acid, neither of these specimens exceeds in richness ordinary fertile soils; in fact by reference to the table on page 131 in the present report, it will be seen that they possess amounts under, rather than above, the average found in representative virgin soils. In nitrogen, the river mud is fairly rich, the percentage equalling that found in the most fertile soils. To light, sandy soils that contain in the neighbourhood of ·1 per cent nitrogen, this mud would act beneficially. The mussel mud possesses about two-thirds of the amount of nitrogen present in the river mud. The carbonate of lime, derived from the mussel shells, amounts to 38 per cent.

WOOD-ASHES.

It may not be amiss to again call the attention of farmers to the fact that the percentage of soluble or available potash even in the most fertile soils, is extremely small, and further, that without rational treatment the successive growth of crops more or less depletes this store.

When the produce of the land is fed upon the farm, nearly 80 per cent of the plant food withdrawn from the soil by the crops is returned in the manure and thus fertility maintained. When, however, the produce is sold, and no concomitant return made, the effect of continuous croppings must be to leave the land poorer and more particularly so in its available nitrogen, phosphoric acid and potash. According to the degree to which this latter style of farming is indulged in, so must these fertilizers brought from outside sources be added to the soil.

Leaving out of consideration for the present barnyard manure and muck deposits—which do but return to the soil what has been more immediately taken from it—we may inquire from what outside, but Canadian sources, these valuable and necessary elements for plant nourishment can be obtained. Phosphoric acid for ages to come can be got from our apatite deposits, nitrogen is made available from the atmosphere through the agency of the leguminosæ (pease, clover, &c.) a comparatively rapid process, but of potash Canada has, as far as we know, no natural deposits save those which are stored in the trees of her forests.

In wood-ashes are the mineral or inorganic constituents which the trees by a slow, life-long process have taken from the soil—and chief among these is potash. As a special fertilizer for supplying potash, wood-ashes are of the greatest importance to the Canadian farmer. Nor should it be forgotten that they are also valuable for phosphoric acid, lime and other inorganic plant food, which they furnish in notable quantities.

The following analysis, made during the past year, of an excellent sample forwarded from Williamston, N. S., is now given. Analyses of flue-ashes and of the ashes of oat hulls have also been made and are here stated in tabular form, for the sake of comparison:

ANALYSES OF ASHES.

Constituents.	Wood-ashes from Williamston.	Flue-ashes from Montreal.	Ashes from Oat hulls from Fergus, Ont.
Moisture	4·19	·19	1·06
Organic and volatile matter	....	2·22	6·14
Insoluble matter	4·48	65·04	84·62
Oxide of iron and alumina	·78	16·28	·40
Lime (CaO)	36·40	7·51	1·02
Magnesia (MgO)	4·40	1·76	·67
Potash (K_2O)	12·00	·19	3·59
Soda (Na_2O)	·93	·40	·57
Sulphuric acid (SO_3)	·58	3·32	·15
Phosphoric acid (P_2O_5)	1·67	1·24	·60
Carbonic acid, &c.	34·57	1·85	1·18
	100·00	100·00	100·00

Assigning the following values to the chief constituents: Potash, 6 cents per lb., and phosphoric acid, 5 cents per lb., the wood-ashes are worth \$16.07 per ton, the flue-ashes, \$1.24 per ton and the ashes from the oathulls, \$4.90 per ton.

WOOD-ASHES.—For orchards, vineyards and small fruit plantations, wood-ashes are of especial value, though at the same time they should be supplemented by a more complete manure. All leafy crops, *e. g.* cabbage, beet and potato, and leguminous plants, as the clover, pea and bean, require a liberal supply of potash and hence are much benefited by an application of wood-ashes.

They are also of much value in improving the tilth of light, sandy soils, cementing together the grains of sand and making the whole more retentive of moisture.

Wood-ashes have long been used to advantage for making a compost with muck or peat. The resulting manure is one that is exceedingly rich in available nitrogen and potash.

With these facts before us, I may be pardoned for again impressing upon our farmers and fruit growers the good returns resulting from the home use of Canadian wood-ashes, which is yet extremely limited, compared with the quantities exported. It is to be hoped that in the future their true value will be more and more recognized and appreciated throughout the Dominion.

FLUE-ASHES.—These were collected at the base of a flue from a furnace in which coal was burnt, and hence they may be considered as fine coal-ashes. They have an exceedingly low fertilizing value, the value of potash present being only 22 cents per ton of the ashes. Such material, however, serves a useful purpose in mellowing heavy clay soils.

ASHES OF OAT HULLS.—These were from a by product in the manufacture of oatmeal. As already stated, they have a considerable fertilizing value, though in this respect they are much inferior, weight for weight, to wood-ashes.

GYPSUM.

A specimen from a mine on the Tobique River, N.S., was analysed, with the following result:—

ANALYSIS OF GYPSUM.

Sulphate of lime (gypsum)	68·65
Insoluble rock matter	15·85
Oxide of iron and alumina	3·91
Carbonate of lime	4·98
" magnesia, &c., by difference	6·61
	100·00

Gypsum, in addition to supplying certain elements of plant food, is useful in liberating potash in the soil and absorbing or fixing ammonia.

Though not in any sense a complete fertilizer, an application on rich soils is followed by excellent results. For poor soils, its use must be supplemented by manures containing nitrogen, phosphoric acid and potash.

Gypsum has been found of special value for pease and clover. Since it sets potash free, it is also useful for turnips, Indian corn and many crops that require large quantities of this element.

Powdered gypsum when sprinkled in stable, cow-houses, &c., preserves much ammonia (valuable plant food) that would otherwise escape and be lost. Its use therefore for such a purpose is to be strongly recommended.

LEGUMES.

Several members of the leguminosæ, to which the pea, bean and clover belong, have been analysed during the past year and their composition is now given. The plants of this order are characterized by a large percentage of albuminoids, and consequently as a rule make more valuable fodder than the grasses. It has been shown of late years by carefully conducted experiments that they procure a large proportion of their nitrogen (the essential element of the albuminoids) from the atmosphere, a property not possessed, as far as is known, by plants of other families. They have, therefore, been termed nitrogen-collectors, and must be looked upon as of special value, not only in furnishing rich and nutritious fodder, but also in keeping up the fertility of the soil. Green manuring with the legumes, *i.e.*, ploughing under a crop of clover or pease, preferably while in flower, is one of the cheapest and most effective methods of enriching and improving the soil. It increases the amount of organic matter and nitrogen, the latter becoming readily available for succeeding crops.

ANALYSES of Legumes, 1893.

—	Hay or Fresh Material.						Calculated to Water-free Substance.				
	Water.	Ash.	Protein (Albuminoids).	Fibre.	Nitrogen-free Extract (Carbohydrates).	Ether Extract (Fat).	Ash.	Protein (Albuminoids).	Fibre.	Nitrogen-free Extract (Carbohydrates).	Ether Extract (Fat).
Lathyrus sylvestris, Wagneri (green).	79·65	1·53	4·52	6·60	6·50	1·20	7·52	22·23	32·46	31·72	6·07
Lathyrus venosus (hay)........	7·11	7·37	14·06	32 47	34·10	4·89	7·93	15·13	34·95	36·72	5·27
Astragalus Canadensis (hay)..	9·46	6·02	10·75	33·45	38·78	1·54	6·66	11·87	36·95	42·79	1·73
Melilotus alba (hay).....	9·30	5·31	11·75	43·24	27·70	2·70	5·65	12·91	47·67	30·79	2·98
Vicia Americana (hay)............	7·01	7·99	13·87	34·33	35·58	1·22	8·59	14·92	36·90	38·28	1·31

The botanical data contained in the following notes have been kindly furnished by Mr. Jas. Fletcher, Botanist and Entomologist of the Experimental Farms.

LATHYRUS SYLVESTRIS, Wagneri (Wagner's Wood Pea).

This is a fodder plant of recent introduction, and said to do well even on poor soils. It is a free growing, leafy pea, which in its second year of growth at the

Central Farm, Ottawa, produced a thick mass of leafy stems nearly four feet in height. It flowers profusely during June. It is extremely rich in albuminoids and is reported from England to be relished by the cattle, both in the green condition and as hay. For these reasons and also that it yields a very heavy crop per acre, it may become a valuable addition to our present list of fodders. Our own experience in feeding it is as yet extremely limited. It would appear that the cattle do not at first evince a fondness for it.

LATHYRUS VENOSUS, Mühl.

A free growing, native, perennial pea, with abundance of leaves. Found on the western plains, from which the sample analysed was obtained. There appears to be no statement on record as to its value as a fodder, though judging from the a nalysis it is well worthy of trial.

ASTRAGALUS CANADENSIS, L. (Canada Milk-vetch).

A stiff, free-growing, vetch-like plant, with abundant foliage and spikes of greenish yellow flowers. It occurs usually on river banks and sometimes attains a height of three feet. Flowering period, July. The sample analysed was sent by Wm. Tingey, Esq., Marieton, Assa., N.W.T., who stated that it was cut about two weeks after it had passed its prime. Probably a palatable and nutritive feed if cut while yet young, but no experience of it as a fodder is recorded, beyond that of Mr. Tingey to the effect that "cattle are particularly fond of it."

MELILOTUS ALBA, Lam. (Bokhara Clover, White Melilot).

An introduced biennial. It is a tall, coarse plant, well known for its sweet odour. It occurs now in many waste places throughout Canada as a weed. It produces a large quantity of fodder, which when cut young is succulent and readily eaten by cattle.

VICIA AMERICANA, Mühl.

A native, perennial vetch, with fine leaves. This sample was obtained on the western plains, where it is an important fodder. Judging from the analysis, it compares very well in feeding value with the preceding legumes.

EXPERIMENTS WITH CARROTS.

It is well known that certain roots have the habit of growing out of the ground, developing to a large extent above the surface of the soil. This exposed portion is green, due to the development of chlorophyll by the action of sunlight. As this tendency is marked among certain varieties of root crops, more especially carrots, it became interesting to ascertain what difference, if any, as revealed by chemical analysis, existed between the lower, underground portion and that which was exposed.

To this end, four White Belgian carrots were selected, nearly half of each root being green, due to growth above ground. They were cut in two at the line of junction of the green and white portions. The weight of the parts were as follows:—

	Lbs.	Ozs.
Upper and green parts	2	10
Lower and white parts	3	7
Total weight of four roots	6	1

These were then submitted to analysis, with the following results:—

	Water.	Albuminoids.	Fat.	Nitrogen-free extract.	Fibre.	Ash.
Upper (green) portion	89·04	1·05	·41	7·54	1·11	·85
Lower (white) portion	90·70	·75	·21	6·65	·93	·76

The composition of the dry matter is given in the subjoined table.

	Albuminoids.	Fat.	Nitrogen-free extract.	Ash.
Upper (green) portion	9·60	3·72	68·81	7·70
Lower (white) do	7·97	2·31	71·51	8·17

These data show that in many particulars the composition of the exposed and underground parts is very similar, and that the differences, where such exist, are by no means large. The most notable of these are in the albuminoids and fat. The slightly higher percentage of the former, recorded as occurring in the exposed portion of the carrot, may probably be due to the presence of the green colouring matter (chlorophyll), which contains nitrogen as a constituent, or it may be owing to a development of soluble nitrogen compounds, whose function is to carry this important element from one part of the plant to another to be finally laid up as protein. Further experiments will be made to ascertain if this increase of nitrogen compounds is constant in the parts developed above ground, and also to find out the true character of such compounds. For the present, it will suffice to say that the apparent increased percentage does not in all probability represent any real or material increase in food value. The larger proportion of the constituent here designated as fat, found in the upper part of the root, is undoubtedly due to the presence of chlorophyll, which by the method of analysis is dissolved out and determined with the fat. This increase, therefore, has a fictitious and not a real value.

It may be concluded from the chemical data of the present experiments that no material difference in food value exists between the two portions. The questions of palatability and digestibility (since disagreeable and poisonous principles are sometimes developed in exposed roots), as well as the economic one of cost of culture and harvesting and weight of crop, are probably the most important to be considered in arriving at a conclusion as to the relative merits of those varieties of roots which grow above and below ground.

THE BABCOCK TEST.

In June of this year, a bulletin (No. 13 of the Dairy series) was issued, in which I gave full instructions for working this test in the dairy, for single and composite samples—the latter by the use of potassium bichromate as a preservative. Information was also added, necessary for the calculation of the payments to patrons of creameries and cheese factories in which the percentage of fat in the milk has been adopted as a basis of remuneration.

Since that date, many questions have been received regarding the manipulation of the composite test. Chief among these have been those that referred to the maximum and minimum quantities of potassium bichromate that can be used without affecting the reading of the fat obtained. Several series of experiments were accordingly instituted to establish the limits between which this preservative can be employed with certainty, and also to ascertain the length of time a composite sample so treated may be kept without showing a diminution in its fat contents.

Composite samples were prepared in duplicate from the milk of a herd which, during the week that the samples were taken, gave the average of 3·40 per cent of butter-fat as the mean of the daily tests.

While preparing the composites (from Monday to Saturday) and until the test was concluded, the bottles were gently shaken every day to incorporate the risen cream and to prevent the latter from sticking to the sides of the bottle. The temperature of the samples throughout the test would average about 63°F.

EXPERIMENT A.

Date of composite samples, May 8th–15th, 1893.

Mathematical average of daily tests: 3·40 per cent fat.

Composite sample A. = 600 c.c. milk + ·3 grms. potassium bichromate.

" " B. = 600 c.c. " + ·6 " "

(*Note.* These quantities of potassium bichromate are equal to 4½ grains and 9 grains to the pint respectively.)

The percentage of fat was ascertained in these samples on the subjoined dates, with the following results:—

Date.	A. Fat, per cent.	B. Fat, per cent.
May 15th	3·4	3·4
" 20th	3·4	3·4
" 22nd	3·4	3·4
" 27th	3·4	3·4
June 3rd	3·4	3·4
" 10th	3·4	3·4
" 17th	3·4	3·4

These tests were made with the usual quantity of acid and gave clear readings throughout.

It may fairly be concluded from these results that (1) any quantity of potassium bichromate between 4½ grains and 9 grains to the pint serves equally well in preserving the milk in a fluid condition without interfering with the accuracy of the Babcock test, and (2) that milk so treated, if kept carefully shaken and moderately cool, shows the same percentage of fat for at least one month.

Experiment B.

A second series of composite tests was made during the week, May 15th to 22nd. The mathematical average of the daily tests of the samples going to make up the composites A and B was 3·05 per cent fat.

The series was carried on in duplicate:—

Composite sample A.= 600 c.c. milk + 1·2 grms. potassium bichromate.
" " B.= 600 c.c. " + 2·4 " " "

(This is equal to 18 grains and 36 grains to the pint, respectively.)

The fat readings are as follows:—

Date.	A. Fat, per cent.	B. Fat, per cent.
May 27th	3·0	2·95
June 3rd	3·1	3·00
" 10th	3·1	3·00
" 17th	3·0	3·00
" 24th	3·0	2·95
July 7th	3·0	2·90

After this last date the fat in both samples became slightly curdy and the percentage gradually lower. The samples were shaken daily and tests made every week until September 26th, when the respective readings were A. 2·20 per cent fat; B. 2·50 per cent fat. Both samples had curdled and were measured with difficulty.

For more than seven weeks the milk had retained its fluidity and yielded a correct percentage of fat, though the preservative had been increased to 36 grains to the pint.

Experiment C.

A further series was then commenced in which composite sample A. had 36 grains potassium bichromate, and B. 72 grains potassium bichromate to the pint. The fat readings were made at intervals of one week from June 3rd to September 30th. The mathematical average of the percentages of fat, obtained from the daily tests of the samples making the composites, was 3·51.

The results were in accord with those obtained in Experiment B., viz., the percentage of fat *after a time* became gradually less. On September 9th, the fat in both samples read 3·1 per cent. It was further observed that, as the quantity of bichromate was increased, the volume of acid had to be slightly decreased in order to get clear readings. Towards the close of the test period, as the bichromate becomes reduced, however, the volume of acid must again be increased.

Experiment D.

Date of composite sample, May 29th—June 3rd. Potassium bichromate to the amount of 230 grains to the pint was added. The percentage of fat, as obtained from the mathematical average of the daily tests, was 3·35.

The normal quantity of acid (17·5 c.c.) charred the fat so that it could not be read. The amount was gradually reduced till the readings became distinct, and as a result it was found that 11·5 c.c gave clear readings and the correct percentage of fat. On June 24th the milk with this quantity of acid still showed 3·3 per cent fat. After this date the milk became lumpy and the fat adhered to the sides of the bottle, so that a representative sample could not be taken up in a pipette.

Conclusions.—A consideration of all these results will show that the exact amount (*i.e.*, within certain limits) of potassium bichromate to be added is of no moment. For ordinary work from 3 to 7 grains (measured roughly on the point of a knife or in a small

spoon) is ample, and is to be recommended as giving excellent results. The daily shaking of the composite when adding a sample, should be done gently and thoroughly, and the bottle kept in a cool place. If the fat readings are obscure through charring due to excess of the preservative, the quantity of acid must be slightly reduced.

The basis or plan of paying in creameries and cheese factories for milk according to its percentage of fat, as made possible by the Babcock test, appears to give excellent satisfaction to all parties concerned, and it is pleasurable to note that every succeeding year marks its more extensive adoption. It puts the value of the milk upon the constituent that is of the greatest commercial value, and at the same time does away with the necessity of irritating inspection. It encourages good breeding and good feeding, and gives an impulse to intelligent and economic farming. It affords to each patron a just and equitable recompense for his merchandise and must present itself as being the best basis so far brought forward for the purchase and sale of milk.

DESICCATED MILK.

A sample of this substance, which is made by the evaporation of milk, to which a certain amount of cane sugar has been added, was forwarded from Souris, Prince Edward Island, where it had been manufactured.

It is in the form of a yellowish-white powder, and it is claimed that it may be preserved in good condition and palatable for a length of time, even though exposed to the atmosphere. If it possesses this latter quality, it may for certain uses replace the ordinary condensed milk.

In view of its possible introduction into the markets as a Canadian dairy product, its analysis was deemed advisable.

ANALYSIS.

Water	5·44
Fat	21·73
Albuminoids (casein and albumen)	18·01
Ash	3·15
Milk sugar	25·22
Cane sugar	26·45
	100·00

WELL WATERS.

It is undoubtedly owing to what has been said in previous reports that year by year there is to be noticed an increased interest taken by farmers in the condition of their water supplies. This is indeed encouraging, but from the character of the samples forwarded for analysis, it is plain that our warnings as to the danger of pollution from the barnyard, stables, &c., must be continued. It is probably true that those only who very strongly suspect contamination send samples—since farmers wishing an analysis are required to follow instructions (forwarded on application) and also to prepay express charges—yet the data here given emphasize the fact that many waters used on Canadian farms are seriously and dangerously polluted. In the majority of instances there is no necessity to have impure water, the contamination of the supply being due to the location of the well in the barnyard or stable, or in the vicinity of some such source of pollution. As a matter of course, such wells must act more or less as cess-pools.

ANALYSES OF

Results stated in

No.	Name.	Locality.	Date.	Free Ammonia.	Albuminoid Ammonia.	Nitrogen in Nitrates and Nitrites.	Chlorine.	Total Solids at 100° C.
1	Quarantine Station..	Partridge Island, N.B...	Nov. 30..	·056	·130	·250	36·2	104·0
2	" " ..	" ...	" 30..	None.	·058	1·104	19·5	112·0
3	" " ..	" ...	" 30..	·024	134	1·504	25·5	138·0
4	Allen Bros..........	Winona, Ont.	Feb. 2..	4·270	·05	None.	440·0	3536·0
5	Mummery, A. R	Chatham, Ont.	" 3..	·04	·144	·023	3·5	385·0
6	Radley, E. C........	"	" 3..	·628	·162	·056	100·0	465·0
7	Kemp, D	Weymouth, N.S........	" 3..	·004	·104	5·06	22·0	182·0
8	Rice, B. Spring......	Regina, Assa., N.W.T..	" 4..	·21	·11	....	23·5	4240·0
9	"	" ..	" 4..	·965	·285	... .	180·0	18390·0
10	Johnson, Basil J.....	St. Louis, Co. Kent, N.S.	Mar. 29..	·028	·066	·640	125·0	324·0
11	" ...	" ..	" 29..	·14	·155	·963	35·0	252·0
12	Carpenter, F.M., M.P.	Stony Creek, Ont.......	" 29..	None.	·064	2·444	430·0	1864·0
13	Petapiece, Geo. E....	Manotick, Ont	April 5..	28·00	......	....	250·0	1134·0
14	....	Yarker, Ont..........	May 1..	·97	·78	·7322	28·0	398·0
15	Dunning, W. H......	Sandwich, Essex, Ont...	" 15..	·97	·044	·180	483·0	4147·2
16	Dill, J. W...........	Moosomin, N.W.T......	June 14..	·78	·154	None.	12·0	1867·2
17	Shearer, Jas.........	Dromore, Co. Grey, Ont.	" 16..	·032	·022	·026	5·0	226·8
18	Dunning, W. H......	Sandwich, Essex Co., Ont.	" 26..	1·01	. . .	·022	500·0	4146·0
19	Gordon, J. G........	Moose Jaw, N.W.T......	July 10..	·048	·104	....	10·0	610·0
20	Kelsey, J. F.........	Agricola, Alta., N.W.T..	" 25..	2·19	·455	....	10·5	720·0
21	McDonald, Jas.... .	Starbuck, Man..........	" 25..	1·705	·070	....	2276·0	5915·0
22	Experimental Farm..	Agassiz, B.C...........	" 31..	·032	·024	·046	2·5	83·6
23	Knight, Wm	"	" 31..	·028	·074	·03	1·4	140·0
24	McDonald, Hugh....	Mabou, C.B	Aug. 11..	·33	·24	....	293·0	....
25	"	"	" 11..	·10	......	....	275·0	....
26	Campbell, R	Quebec.	" 12..	·036	·04	·349	6·0	....
27	"	"	" 12..	Trace.	·054	·27	17·0	....
28	"	"	" 12..	·106	·084	2·787	13·0	... .
29	"	"	" 12..	·112	·425	·023	15·0	....
30	"	"	" 12..	·024	·324	·095	10·5	....
31	"	"	" 12..	·256	·098	2·161	15·0	....
32	Fathers, Joseph......	South Cayuga, Ont.	" 31..	·229	·314	·804	46·0	2468·4
33	Tragnair, Wm.......	Welwyn, Assa., N.W.T.	Sept. 26..	1·676	·084	None.	23·0	1855·2
34	Tattrie, Calvin......	River John P.O., N.S...	Oct. 6..	·016	·042	9·24	85·0	566·0

WELL WATERS—1893.

Parts per Million.

Solids after Ignition.	Loss on Ignition.	Oxygen absorbed at 80° F. In 15 Min.	Oxygen absorbed at 80° F. In 4 Hours.	Phosphates.	Report.
80·0	24·0	·740	1·748	faint traces.	Fair; not polluted by sewage.
86·0	26·0	·268	·6768	"	Of purer quality than No. 1.
104·0	34·0	1·0032	2·1876	"	Fair, though too much vegetable matter.
3186·0	350·0	·038	·2844	traces.	Unfit for use; polluted by drainage from stable.
290·0	95·0	....	....	"	Fair; no indication of sewage pollution.
385·0	80·0	....	....	heavy traces.	Unfit for use; polluted by drainage.
132·0	50·0	·4572	1·004	traces.	Suspicious; previous contamination indicated.
3780·0	460·0	·7156	1·384	heavy traces.	Seriously polluted; unfit for use.
16752·0	1638·0	1·6432	3·1568	"	An exceedingly bad water.
276·0	48·0	·640	1·200	"	A fairly good water, though chlorine too high.
210·0	42·0	1·532	2·308	"	Not safe for drinking purposes; polluted.
1462·0	202·0	·252	·548	....	Second class; with suspicious features.
928·0	206·0	2·584	5·076	very heavy traces.	Totally unfit for drinking purposes; very bad.
222·8	175·2	6·4952	13·3732	"	Very bad water.
3198·4	948·8	None.	·18	....	The free ammonia and chlorine indicate presence of liquid manure.
1428·0	439·2	2·0132	3·6364	traces.	Unfit for drinking purposes.
135·2	91·6	·1492	·3048	none.	Excellent; perfectly wholesome and ranking with first-class waters.
3052·0	1094·0	....	....	....	Polluted as in No. 15.
440·0	170·0	....	....	none.	A good water; safe for drinking purposes.
566·0	154·0	....	....	very heavy traces.	Seriously polluted and unsafe for drinking purposes.
4870·0	1045·0	....	....	none.	Dangerous to use; a bad water.
60·4	23·2	·296	·594	"	A first-class water of excellent quality.
87·0	53·0	....	....	....	An excellent water.
....	....	....	....	....	Not fit for drinking purposes.
....	....	....	....	....	" "
....	....	....	....	....	A good drinking water.
....	....	....	....	....	Probably a good and safe water.
....	....	....	....	....	Polluted.
....	....	....	....	......	Polluted; not fit for drinking purposes.
....	....	....	......	....	A very fair water; safe to drink.
....	....	....	....	....	Condemned as a drinking water.
1965·2	503·2	2·230	4·308	none.	Dangerously contaminated.
1482·0	373·2	·3764	·7532	traces.	Seriously polluted; unsafe for drinking purposes.
311·0	255·0	....	....	....	Shows previous contamination.

It would unnecessarily burden these pages to give here in full the reports forwarded to the farmers who sent the samples, but sufficient is said in connection with the analytical data to point out the general character of the waters.

It would only be reiterating what has been said in previous reports were I to state here the reasons why it is of paramount importance to have pure water on the farm. It is only necessary to add that such is indispensable for the good health of man and beast, and that it is only a matter of time before the effects of an impure supply are apparent to those who choose to see them, indeed to all but the most careless. I am well assured that much sickness on the farm and poor results in the stable and dairy are to be attributed to polluted water, rather than to the causes which many now assign them.

It is remarkable that only a very small proportion of those who write for (and receive) the instructions we issue for taking the water, forward a sample. It indicates that many do not consider the knowledge of the character of their well water as worth the trouble and expense consequent upon sending the sample.

MISCELLANEOUS.

EXPERIMENTS TOWARDS THE IMPROVEMENT OF CERTAIN SALINE WATERS.

From the examination in our laboratories of several samples of saline, or, as they are usually called, alkaline waters from the North-west Territories and Manitoba, it has become apparent that many contain a large amount of Epsom salts or sulphate of magnesium. In some instances this is associated with other saline matter, as sulphate and chloride of sodium (Glauber's salt and common salt), but it often occurs that the Epsom salts is the chief, if not the only, foreign saline material. The well known purgative effect on man and animals which follows the drinking of such waters makes their improvement a subject of the greatest importance, especially to those situated in localities where ready access to a supply of pure water is not attainable.

To the end of being able to suggest a method of treatment that would result in making these waters potable, the following experiments were made:

A. To 50 c.c. of a saline water containing Epsom salts were added 100 c.c. of lime water, which precipitated the magnesia as the flocculent hydrate. After settling till the supernatant fluid was clear, the whole was filtered, and the filtrate tested for magnesia with negative results. The washings of the magnesium hydrate however showed traces, pointing to the fact that while magnesium hydrate is insoluble in dilute lime water, it is slightly soluble in pure water, probably owing to the latter containing some carbonic acid gas in solution.

B. To 100 c.c. of a 1 per cent solution of Epsom salts ($MgSO_4$, 7 H_2O) 200 c.c. of lime-water were added. After standing several hours and filtering, 100 c.c. of the filtrate, after separation of the lime, were tested for magnesia. A very slight precipitation ensued. This precipitate was carefully determined and found to be equal to ·00064 gram of magnesium oxide. By calculation it is ascertained, therefore, that 1·18 per cent. of the original amount of Epsom salts was still in solution, or in other words, the 1 per cent. of Epsom salts had been reduced by this treatment to ·01 per cent.

These experiments being considered very fairly successful and satisfactory in showing that lime-water can precipitate the magnesia in an inert form, the next step was to ascertain if, after treatment, simple exposure of the water to air would serve to separate out the excess of lime used for precipitating the magnesia as the insoluble carbonate. For it should be noted that the water after the precipitation of the magnesia is strongly alkaline and caustic, due to the presence of the lime as already explained. The experiment now to be detailed offers a solution to this question.

C. The saline water used was taken from the same sample as that employed in experiment A. It was forwarded from near Regina, N.W.T., and contained 715 grains of Epsom salts to the gallon. To 100 c.c. of the water were added 200 c.c. of lime-water,

the subsequent treatment being that already described in experiments A and B. The filtrate from the magnesium hydrate was exposed in a shallow dish to the atmosphere of the laboratory for ten days. A considerable precipitation of carbonate of lime ensued, due to carbonic acid in the air, and the water was no longer found to be alkaline to test paper, proving the absence of caustic lime.

From the results of these experiments, I think we may fairly conclude (1) that by the use of lime-water the deleterious magnesium salt may be practically removed, and (2) that by the subsequent exposure of the treated water to the atmosphere, the excess of lime used in precipitating the magnesia may be precipitated as the innocuous carbonate.

No practical application of this mode of treatment on a large scale has yet been made, though its cheapness, simplicity and thoroughness warrant me in suggesting it as well worthy of trial by those compelled to use water more or less impregnated with Epsom salts. Wooden tubs or troughs could be used for the precipitation and subsequent exposure, and no expense, save the cost of the burnt lime, need be entailed. The precipitation of the magnesia and subsequently of the lime by exposure might proceed simultaneously and in the same vessel, and the clear supernatant water subsequently poured or siphoned off. If such a process were adopted, care must be taken not to have too great an excess of lime, or the total conversion into carbonate would take a very long time.

It must be remembered that the water so obtained, though free from Epsom salts and caustic lime, would not rank as first class. It would be a hard water, containing both sulphate and bicarbonate of lime, the latter, however, could be got rid of by a subsequent boiling, which would throw it down as the insoluble carbonate. If the water, however, did not originally contain much sulphate and chloride of sodium, I am of the opinion that a fairly palatable water would result, and certainly one much more wholesome than the original.

SLUG-SHOT: AN INSECTICIDE.

A sample of this material was forwarded by a correspondent in Cape Breton, accompanied by a request for its analysis and a report as to its value for killing the potato beetle.

It is a pinkish red, earthy powder, not unlike burnt clay. It was carefully examined for arsenic and other poisonous compounds with negative results. Further examination proved it to contain flowers of sulphur. This constituent was determined and found to be 5·4 per cent. It is scarcely necessary to add that this material must prove valueless for preserving potato vines from the ravages of the potato beetle.

THE VALUE OF DILUTE SULPHURIC ACID FOR CHECKING THE SPROUTING OF POTATOES.

From a series of experiments recorded in my last report,* the conclusion arrived at under the conditions of the experiments was that a 2 per cent solution of sulphuric acid was valueless for checking the sprouting of potatoes. These trials were, however, made in the spring, and the treated tubers were not protected from light—conditions which it was thought were perhaps unfavourable to the best results of the treatment. In the experiment the results of which are now given, the potatoes were treated in the autumn and preserved in the dark.

On November 30th, 1892, three varieties of potatoes, Early Ohio, Beauty of Hebron and State of Maine were treated (*a*) for twenty minutes and (*b*) for one hour with a 2 per cent solution of sulphuric acid. Immediately after the expiration of these periods, the several samples were repeatedly washed with water, allowed to drain, placed in jars and stored in a dark place, the other details of the experiments being similar to those given last year. On March 13th, 1892, the potatoes were

*Pages 141, 142, Report of Experimental Farm, 1892.

examined. The potatoes of all the samples, both treated and untreated (the latter being stored as checks) had sprouted. It was noticed that the sprouts of the treated tubers were longer than those of the untreated, showing apparently that the action of the acid treatment was to accelerate rather than retard the sprouting. These results corroborate those obtained and reported on last year. The sprouting of the untreated tubers, as well as of the treated, may probably have been assisted by the presence of air which freely surrounded the potatoes in the jars. Potatoes stored in a bin have smaller air spaces between them, and under such conditions it is found that those on the surface are the first to sprout. It is, however, quite evident from our two years' work on this subject that 2 per cent sulphuric acid has not the deterrent action in preserving potatoes that has been claimed for it.

REPORT OF THE ENTOMOLOGIST AND BOTANIST

(JAMES FLETCHER, F.R.S.C., F.L.S.)

W. SAUNDERS, Esq.,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to hand you herewith a report upon some of the more important subjects which have been brought officially under my notice during the past season.

DIVISION OF ENTOMOLOGY.

With regard to insects injurious to the agricultural industries, the enormous increase and spread of the Cattle Horn-fly claim first mention. This fly has undoubtedly caused great loss. Where the well known remedies have been applied perseveringly, there has been decided relief to the infested cattle, and much needless loss has been averted. In most instances of failure, I have found on inquiry that the remedy had been applied once or twice only and then given up. Canadian farmers must recognize the fact that this is an exceptional visitation, and that therefore they must take exceptional measures to combat it. As to the trouble and expense of these measures, leaving aside altogether a consideration of the cruelty to the animals, that is merely a matter of dollars and cents. The question which all must ask themselves, is, Will the benefit I shall reap overbalance the cost of the applications? In reply to this I can answer emphatically that it will, many times over, and further, that the better they attend to the instructions given, so much greater will the profit be. Judging from the past history of the introduction and spread of this pest in America, I am led to hope that in districts which have been badly infested this season, the attack will be decreasingly less severe year after year in future.

Grasshoppers have been destructive in western Ontario and a few of the usual fruit pests have been locally abundant. Two of the worst of these, the Plum Curculio and the Codling Moth, have caused much injury in Ontario. Spraying the trees with Paris green for both of these pests still remains the best remedy. Where the work is done carefully and intelligently it is practically all sufficient, the occasional cases of failure which are sometimes heard of, and these are very rare, are almost invariably due to careless work. One of the most remarkable instances I have ever seen of the results of good careful work, was in the orchard of Mr. S. A. Fisher at Knowlton, Que. When I visited him in September last, I could not find in his orchard a single apple which had been injured by the Codling Moth. This was the first year he had sprayed his orchard. In previous years his crop had always been badly infested, and this year the orchards of his neighbours all around him, none of which had been sprayed, were so still. In British Columbia, where fruit-growing has become a leading industry of the country, the Apple Aphis has developed in a remarkable manner and is doing much harm. Besides information from my own correspondents I see by the extremely valuable report for 1892, published by Mr. J. R. Anderson, the Statistician of the Department of Agriculture of British Columbia, one of the best colonial reports I have ever seen, that this insect is alarmingly abundant and destructive throughout the province.

Early in October by the kind permission of the Hon. Minister of Agriculture, I had the great advantage of attending the World's Columbian Exposition at Chicago, where I not only acquired much information of value to my department by examining the many excellent collections of insects there displayed in illustration of the value of applied entomology, but was able to be of service in reporting upon certain pests of stored grain, which just at that time had been noticed to be destroying the cereals exposed as samples or used in ornamentation of the various courts in the Agricultural Building. From the fact that very few connected with the exhibits knew the life histories of the pests concerned, there was a good deal of unnecessary anxiety at the time of my visit, which I was pleased to be able in a measure to allay. The entomological division of my department was represented at Chicago by a collection of 20 cases of insects systematically arranged. In the preparation of this collection I was materially assisted by Mr. J. Alston Moffat, of London, who arranged the cases of moths, and by Mr. W. Hague Harrington, of Ottawa, who prepared two beautiful cases of Hymenoptera. I have also to gratefully acknowledge donations of insects from the Entomological Society of Ontario, the Rev. C. J. S. Bethune, of Port Hope, Messrs. H. S. Saunders and W. Rennie of London, Ont., and Prof. W. Saunders, of Ottawa. When finished, the collection presented a very creditable appearance and, when returned, will form the nucleus of a reference collection at the Central Experimental Farm. Such a collection for reference has been much needed in the past. I hope during the coming winter to much increase this collection from the large amount of material which had accumulated previous to the appointment of my assistant, Mr. Guignard, and which could not be arranged, owing to pressure of other work.

DIVISION OF BOTANY.

In the Division of Botany the experiments with grasses, native and foreign, have been continued and have attracted much attention from visitors to the farm. The increased importance of the dairy industry during the last decade, has naturally drawn much attention to the subject of fodder plants. The experimental grass plots covering about 1½ acres are situated on a piece of moderately good land, lying to the west of the main road to the office and between the road and the poultry house. The ground is varied and provides the different kinds of soil and degrees of moisture necessary for the testing of grasses of various habitats. The method which has been followed in furnishing these beds has been to obtain seed by exchange, purchase or collection in the field, and cultivate the plants until a sufficient quantity were on hand to set out a plot of one square rod to each species. There are about 130 of these plots now in use. It is considered that plots of this size are large enough to give a correct idea of the value of a grass from its habit of growth and weight of product per acre. In addition to the whole plots of 1 square rod are half plots where grasses are grown which are of known value or have been tested and which may be of interest to visiting farmers. Grasses of botanical interest only are grown in mixed beds, about 4 rows being given to each species. A bulletin (*C.E.F.*, No. 19.) having been lately issued entitled: "*Grasses, their Uses and Composition,*" treating of the work of this department in that line, it is not thought advisable to devote much space in this report to that subject. Experiments have been carried on, but are not yet completed with permanent pasture and hay and lawn mixtures. Samples of the best mixtures offered for sale by seedsmen were secured and sown, and although on the whole these mixtures were satisfactory, there were several points in which it was thought they could be improved. Some of the grasses which form a large proportion of the mixtures were not suited to our climate, and others came to maturity at seasons so different that the grasses could not all be at their best when mown for hay. Careful notes have been kept of the time of flowering of all the different varieties year by year, and these have been made use of in some trial mixtures for hay which have been sown in 6 large plots of $\frac{1}{20}$ acre each, lying to the north of the road leading to the poultry house and beyond the row of birch trees shown to the right of the illustration. In addition to the true grasses about 15 plots have

been devoted to clovers and other fodder plants; these lie immediately in front of the poultry house. Early last spring a distribution of seeds of grasses for trial was made to farmers in all parts of the Dominion: over 1,000 packets were sent out to 110 different individuals. With the seeds a letter of instructions was sent and a blank form for filling in data as to time of sowing, flowering, etc. I am sorry to say that very few reports have been so far received, which is much to be regretted; for farmers all over Canada are buying large quantities of grass seed every year much of which is quite useless to them. If these reports were made, we should have exact data from all provinces which could be tabulated and would then be of great economic value.

A large addition has been made to the collection of plants in the Arboretum and Botanical Garden, details of which will be found on page 34 of this report.

There has been much correspondence concerning Weeds, particularly from the North-west and Manitoba, where farmers seem to be alive to the importance of destroying these agricultural marauders which drain the soil of its nourishment and choke out the crop. A special collection, separate from the large *hortus siccus*, is being prepared of the weeds of the farm, as well as a reference collection of the seeds of weeds for examination and comparison.

Meetings.—I have during the year attended nine agricultural meetings to deliver addresses upon subjects connected with my department:—

1. Dairymen's Association of Western Ontario, London, Ont.
2. Farmers' and Dairymen's Association of New Brunswick, at Fredericton, N.B.
3. Central Farmers' Institute, Toronto.
4. Meeting of fruit growers of Lincoln Farmers' Institute, St. David's, Ont.
5–7. District of Bedford Dairymen's Association, Cowansville, Que., followed by two meetings of horticulturists on the following days at Knowlton and Waterloo, Que.
8. County of Carleton Farmers' Institute at March Corners, Ont.
9. Township of Fitzroy Farmers' Institute at Galetta, Ont.

Acknowledgments.—I beg again to express my thanks to my many correspondents who have rendered me much valuable assistance in making observations and sending me prompt notice of the occurrence of injurious insects. I am more and more convinced every year of the value of being in constant correspondence with those actually engaged in the cultivation of the soil. If suggested remedies are successful, the very best must be discovered and made known as widely and as quickly as possible; if they fail, the reason of this must be found out, and if useless, farmers must be warned against them, so that neither labour, time nor money may be lost which might be better employed. I have again to acknowledge many courtesies extended and valuable reports received from colleagues, official entomologists and botanists in other countries, amongst whom I would particularly name Prof. Riley, the United States Entomologist; Miss E. A. Ormerod, of England; Dr. J. A. Lintner, of New York; Dr. J. Ritzema Bos, of Holland; Mr. F. Turner, of New South Wales, and Mr. C. French, of Victoria, Australia.

An object which has attracted much attention in my office is a wall case given by Prof. Fernald, Secretary of the Massachusetts Gypsy Moth Committee, illustrating by means of beautifully mounted specimens the life history of the Gypsy Moth (*Ocneria dispar*, L.), which has been the cause of so much loss in the New England States.

For identification of difficult species I gratefully acknowledge my indebtedness to the following specialists: For Coleoptera, Mr. Albert Fauvel, of France, Dr. John Hamilton, of Allegheny, Pa., Dr. George H. Horn, of Philadelphia, Pa., and Mr. W. H. Harrington, of Ottawa; for Lepidoptera (*Noctuidæ*) Prof. J. B. Smith, of New Brunswick, N. J.; (*Microlepidoptera*) Prof. C. H. Fernald, Amherst, Mass.; for *Coccidæ*, Prof. T. D. A. Cockerell, Las Cruces, New Mexico.

For botanical specimens: Prof. J. Macoun, Ottawa; for microscopic fungi, Mr. J. Dearness, of London, Ont., and Prof. B. D. Halsted, of New Brunswick, N. J.

To all of whom I here respectfully tender my heartiest thanks.

The following donations of plants and seeds have been received during the year:

Prof. Beal, Michigan Agricultural College: collection of grass seeds, 14 species.

F. Turner, Esq., Botanist, Department of Agriculture, New South Wales: seeds of grasses and fodder plants, 19 species.

Prof. O. Lugger, Minnesota Experiment Station: collection of grass seeds, 37 species.

Steele, Briggs, Marcon & Co., Toronto: collection of imported grass seeds, 34 species, and 13 varieties of rape.

W. R. Carles, Esq., Chinkiang, China: seeds of *Stillingia sebifera* and *Anemone cernua;* also bulbs of *Tulipa edulis.*

J. A. Balkwill, Esq., London, Ont.: roots of native plants.

I have the honour to be, sir,

Your obedient servant,

JAMES FLETCHER,

Entomologist and Botanist.

DIVISION OF ENTOMOLOGY.

CEREALS.

The grain crops of the Dominion as a whole have been less injured by insect pests during the past season than has been the case for many years. The only occurrences of unusual severity have been by Cut-worms to wheat in Manitoba, and by Locusts chiefly to oats in Ontario. Specimens of the true Army-worm (*Leucania unipuncta*, Haw.) from which the moths were subsequently raised, were sent to me from Manitoba by Mr. Richard Waugh, of Winnipeg, who writes as follows:—

"August 4.—I send you this day samples of some caterpillars which have appeared in great numbers on the end of a wheat field, just outside the city, eating both blades and ears. The field abuts on the river and the path is strewn with the worms which are in great force."

"August 18.—The army-worm has destroyed a lot of wheat on the east side of the Red River in Northern Minnesota, and I believe our visitation is a stray lot from that section. They devoured both the leaves and the green heads, but vanished in a few days."

The Wheat-stem Maggot (*Meromyza Americana*, Fitch) was observed to a small extent in wheat fields in the Ottawa district; but few complaints were received from other parts. The larvæ were found much more abundantly this year in the root-shoots of grasses than in the stems of wheat and barley.

CUT-WORMS IN GRAIN CROPS.

Year after year complaints are received concerning the injuries of Cut-worms to grain crops, and during the past season, these have been very numerous in Manitoba and parts of the North-west Territories. Up to the present time no satisfactory remedy has been devised to put a stop to these depredations. A great desideratum is more knowledge as to the exact identity and life habits of the species concerned. I trust I may be able next year with the assistance of correspondents in the West, to obtain specimens and work out the life histories and food habits of some of the western Cut-worms, on which there is yet much to learn before a practical remedy can be recommended. The following letters will, I think, give an idea of the urgency

of this case and will indicate the present state of the entomological information in our hands:—

"August 19.—I was told a few days ago, that a report had been sent out by you which contained a simple remedy for destroying cut-worms. If such is the case, I would like to have it sent to me. I had a 20-acre field of wheat entirely destroyed last year when the second leaf was about one inch long. Where the drill teeth ran, the ground was as fine after they had done as if it had been sifted; there was not a leaf to be found. As far as I can learn, this grub is known as the little black grub, and what would kill the cut-worm, would kill it."—JOHN STEWART, *Regina, Assa.*

Reply:—"April 26.—I fear the report that I have a simple remedy for destroying Cut-worms is rather more than I can myself admit. Cut-worms are amongst the most troublesome of our farm enemies, more particularly when, as in your case, they attack grain crops. There are upwards of 400 kinds of Cut-worms, some of which differ from the others in their habits. I shall be obliged if you will send me this spring some living specimens for examination. This can be done easily by mail and free of postage. As the Cut-worms you refer to attacked your grain crop, it is just possible that they might not injure some other plants, such as potatoes, which do not belong to the Grass family, like the small grains. Could you not put your infested field under some other crop next season, so as to try this?"

"June 12.—The Cut-worms are not so numerous this summer, as they were last. This evening I could only obtain a few. Last 12th of June, they could have been got by the handful. I send you a box of the grubs."—JOHN STEWART.

Reply:—"June 21.—Yours of the 12th inst. and the insects referred to therein arrived safely. The Cut-worms in your grain crop are the Clay-backed Cut-worm (*Carneades insulsa*, Walk.=*Agrotis campestris*, Grt.), which in many districts of Manitoba and the Territories has done much harm during the last ten years. I find by my notes that this species is always *most numerous where weeds have been allowed possession of the ground during the previous autumn.* Were you able this season, as suggested by me, to put that part of your farm which was badly infested last year under any other crops than grain?"

"June 19.—I am sending you by this mail in a small box some Cut-worms that are doing considerable damage to wheat and oats. A neighbour of mine has had a field of 30 acres of wheat completely cleared by them, and now they have started on my oats in an adjoining field. The land where they began was badly summer-fallowed last year and the weeds came very thickly, chiefly pig weed or lamb's quarters. They seem to have bred in this field. Can you give us any information how to get rid of them? I thought of summer-fallowing all my land on this place next year and sowing timothy. It is no use trying to grow grain where these insects are. I had a small piece of last year's fallow that the weeds had started on this spring, adjoining my neighbour, and when the grubs had cleaned his field they started on the pig weed on mine. I hauled dry straw and manure and covered them up with it and then set fire to it the next day. They got up into the straw over night and I must have burnt millions of them, for I could take them up by the shovelful. I never saw anything like it. I have put feed oats on the land, but expect they will clear the whole. I see they are on many farms here, but the owners do not seem to think much of them, I fear they will be getting worse. There is one thing certain. We shall have to adopt a different method of working our summer-fallows."—WM. RICHARDSON, *Douglas, Man.*

In reply Mr. Richardson was informed that the caterpillars sent were the Clay-backed Cut-worm, and that his theory was correct that the prevalence of these insects was largely consequent upon imperfect summer-fallowing of the previous year.

"June 27.—I inclose a few specimens of grubs which are doing considerable damage to gardens and early summer-fallowed lands. Whole fields are being destroyed by them. Can you give us any information concerning their habits of life, such as how deep the eggs are deposited and if late fall-ploughing would kill them."—JOHN LAWRENCE, *Sewell, Man.*

In reply Mr. Lawrence was informed that the species was the same as referred to above, and the usual remedies were given.

Early last spring I had some correspondence with Mr. Richard Waugh upon this subject, which began by his sending me a letter from Mr. John Stewart, complaining of the injuries to his crop of 1892, in which he also mentioned that a crop of flax had been left untouched; to this I replied, March 26:—"I have read your correspondent's letter carefully and noticed that the crops attacked by the caterpillars were oats and wheat (Gramineæ), and that flax the only other crop mentioned, which belongs to a different family of plants, was uninjured. Now some of the Cut-worms which destroy grass crops, grains included, do not injure other crops, and it is just possible that the species in question may be one of these. Should this be the case, the simplest remedy which suggests itself is to put the land under some other crop than one belonging to the Grass family for two or three years. Potatoes are good for this purpose, not only because comparatively few insects injure that plant, but because potatoes are late in appearing above the ground in spring. I surmise that the insect complained of is the same Cut-worm as some years ago was sent to me by Mr. A. Burrows, and upon which I wrote an article for *The Nor' West Farmer*. It is difficult to suggest a definite remedy for any insect without seeing specimens. I hope that Mr. Stewart or any other farmers will send me specimens of insects which may trouble them."

"June 7.—Yesterday when at Carberry speaking at the Institute, considerable damage was reported to summer-fallowed wheat by caterpillars of which I send you a sample. Very weedy fields which had been allowed to grow so without disturbance, suffered most, and a cultivated strip in the same field seemed free of the insects. Barley was being sown on the top of the ruined wheat, in the hope that it would escape. I asked one man to try a half bushel of flax. Some allege that late ploughed fallow does not suffer, and it is assumed that deep ploughing and rolling later in the year would either bury them or divert them from coming there. Others allege that mellowness of the soil is as much the attraction as the green weeds. Some years ago a crop of wheat was saved by the grubs eating up the pig weed in the crop and leaving the less palatable vegetation. Such grubs have devoured the crops in clean gardens that were summer-fallowed. Will you please consider this and give us your opinion as to remedial action? Prof. Lugger killed the grasshopper grubs in Minnesota by deep ploughing."

Reply:—"June 21.—The grubs sent with your letter are the Clay-backed Cut worm (*Agrotis campestris*)* which is frequently very troublesome in Manitoba. You are correct when you say that Cut-worms are most injurious where weeds have been allowed to grow undisturbed the previous year. It is just possible but hardly likely that the barley sown where the wheat was ruined will escape. This Cut-worm, I think, comes to full growth only toward the end of June, and the barley would, of course, be up long before that. Grain crops being occasionally saved owing to the fact that the grubs attacked by preference pig weed and other plants growing among them, is merely due to the fact that some varieties of Cut-worms feed only upon certain kinds of plants; but then again on the other hand, others are virtually omnivorous, and will eat anything. There are in Canada about 300 different kinds of Cut-worms, many of which differ widely in their tastes and habits. I am afraid that the deep ploughing remedy for this pest, would not avail much. Prof. Lugger's experiments in Minnesota were with grasshoppers' eggs not with the grubs. There are some Cut-worms which pass the winter in the moth state and lay their eggs in the spring, as in the case of the Army-worm moth. It is just possible that those gardens which were infested after having been kept clean the year before, were devastated by a species having this habit. These, however, are luckily few in number, so that, on the whole, I consider one of the best remedies for Cut-worms is, keeping the land as clean as possible in the autumn."

There is perhaps no one single question concerning which so many inquiries are made by farmers and gardeners every year as the best remedy for Cut-worms.

* = *Carneades insulsa*, Walk.

In my annual report for 1888, I published a rather extensive article upon this subject, but as the edition is entirely exhausted, I reproduce here with a few slight alterations part of that article which I think will be of use at the present time.

"Cut-worms are the caterpillars of dull coloured active moths belonging to the Noctuidæ or Owlet moths, of which there are upwards of 400 on the North American lists. Fig. 1 shows the moth of the Devastating Cut-worm (*Hadena devastatrix*, Brace). Of course, the different species vary somewhat in their habits, but taken as a class they are very similar, and in the present state of our knowledge, it will be more convenient to treat them as a class, at any rate in a report like this, which is prepared particularly with the hope of helping farmers to overcome their insect foes. As Cut-worms are the caterpillars of so many different species of moths, the inaccuracy of speaking of them as *the* Cut-worm is apparent. Moreover many other insects are sent in and reported upon as Cut-worms, which do not belong to this class at all. Of these the White Grubs, the larval state of the June Bugs (*Lachnosterna*), are most often referred to. There is some reason in this from their occasional habit of biting off plants in the manner of the true Cut-worms, which are the caterpillars of the moths referred to above; these latter may be described in a general way as smooth, almost naked, greasy-looking, caterpillars of some dull shade of colour similar to the ground in which they hide during the day. The head is smooth and shining and sometimes of a different colour from the rest of the body. On the top of the segment next to the head is a smooth chitinous plate known as the thoracic shield. There are generally three or four series of bristle-bearing tubercles along each side of the body, and when disturbed the caterpillars curl up into a ring.


Fig. 1.—The Devastating Cut-worm.


Fig. 2.—Cut-worm.

Their habits are almost always nocturnal; they lie hid by day just beneath the surface of the soil and come out at night to feed. When, however, they develop in large numbers, they frequently change their habits and feed by day, owing probably to the reduced food supply consequent upon their ravages. The habits of most Cut-worms are probably as follows. The egg is laid in the spring, summer or autumn, and the insects may pass the winter, either in the perfect moth state, as a chrysalis, as a young half-grown caterpillar, or as an egg. Those which hibernate as moths lay the spring eggs and moths are produced again before winter sets in. Most of the eggs which are laid in the summer or autumn hatch soon after, and the caterpillars either become full fed the same season and pass the winter underground in the chrysalis state, or after feeding for a short time, become torpid and pass the winter as half-grown caterpillars. In this condition they may be found late in the autumn under stones, logs or heaps of dead vegetation, in the roots of grasses or in cells beneath the surface of the ground. Of some, as in the case of *Carneades ochrogaster*, Gn., the eggs are laid in the autumn, but do not hatch until the following spring. The ravages of the young caterpillars which hatch in the summer and autumn, are seldom noticed then, on account of the abundant vegetation at those seasons. In the spring, however, not only are the caterpillars much larger and capable of more mischief, but the land is cleared of all weeds and vegetation other than the crop which is to be grown, and when the Cut-worms, revived by the warmth of the sun and the opening of spring, come from their winter retreats, there is nothing for them to eat but the farmer's early crops. They are particularly troublesome in gardens cutting off young cabbages, tomatoes and other plants, as soon as pricked out. When the caterpillars are full-fed, they burrow into the ground to a depth of some inches and turn to brown chrysalides inside a smooth cell or light cocoon. (Fig. 3.) From these, after a few weeks, the perfect moths emerge. They are very active at night, and when disturbed have the same habit as their caterpillars of dropping to the ground and remaining perfectly still as if dead. From their dull colour they are then difficult to find.

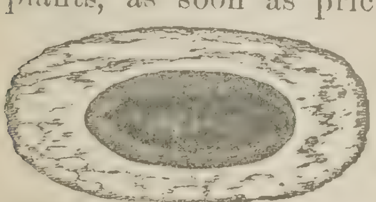


Fig. 3.—Cut-worm Chrysalis in cell.

Fig. 4.—The Gothic Dart Moth. Wings open and closed.

When at rest (See Fig. 4.), their wings lie horizontally over their backs, and the upper ones entirely cover the lower pair. The upper wings are generally crossed with one or more waved lines and always bear two characteristic marks, one about half way down the wing, orbicular in shape, the other nearer the tip, reniform or kidney-shaped. Owing to their nocturnal habits, Cut-worms frequently do a great deal of harm to vegetation without being recognized as the cause. It is important, in the view of discovering useful remedies, to ascertain as soon as possible the habits of all these caterpillars."

The remedies given below are from *Bulletin* 11, of the Experimental Farm series.

Remedies.—(i.) *Clean Culture.* As the young caterpillars of many species hatch in autumn, the removal of all vegetation from the ground as soon as possible in autumn deprives them of their food supply and also prevents the late-flying moths from laying their eggs in that locality. Fields or gardens which are allowed to become overgrown with weeds or other vegetation late in the autumn are almost sure to be troubled with Cut-worms the next spring.

(ii.) *Traps.*—Large numbers may be destroyed by placing between the rows of an infested crop, or at short distances apart on infested land, bundles of any succulent weed or other vegetation which has been previously poisoned by dipping it, after tying it in bundles, into a strong mixture of Paris green (2 oz. to a pailful of water). The Cut-worms eat the poisoned plants and bury themselves and die. In hot, dry weather these bundles should be placed out after sun-down, and a shingle may be laid on each to keep it from fading.

(iii.) *Banding and Wrapping.*—(*a.*) It will be found to well repay the trouble and expense, to place a band of tin around each cabbage or other plant at the time of setting out. These may very easily be made by taking pieces of tin 6 inches long and $2\frac{1}{2}$ wide and bending them around a spade or broom handle so as to form short tubes. In placing them around a plant the two ends can be sprung apart to admit the plant, and then the tube should be pressed about half an inch into the ground. I have found this a useful means of disposing of empty tomato and other cans. To prepare these easily, they need only be thrown into a bonfire, when the tops and bottoms fall off and the side becomes unsoldered. The large piece of tin can then be cut down the centre with a pair of shears, and forms two tubes.

(*b.*) Wrapping a piece of paper round the stems of plants when setting them out will also save a great many and is highly recommended.

(*c.*) Hand-picking or digging out the Cut-worms whenever a plant is seen to be cut off, should, of course, always be practised.

Natural Enemies.—There are two enemies of Cut-worms which deserve especial notice, and, from the good service they do, should be known by sight to every cultivator. They are the Fiery Ground-beetle or Cut-worm Lion (*Calosoma calidum*, Fab., Fig. 5) and the Black Ground Wasp (*Ammophila luctuosa*, Smith) which closely resembles Fig. 6. Both of these are desperate enemies of Cut-worms, the former feeding on them in all of its stages, the latter digging them out and storing its nest with them as food for its young grubs.

Fig. 5.—Fiery Ground Beetle.

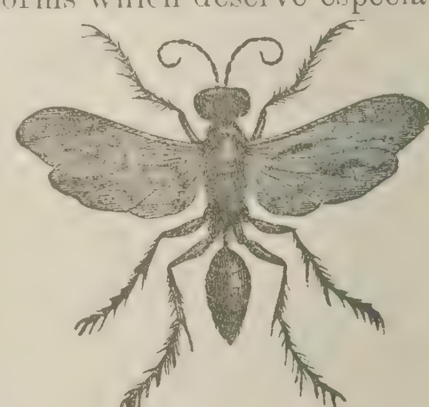


Fig. 6.—Ground Wasp.

THE RED-LEGGED LOCUST

(*Melanoplus femur-rubrum*, DeG.)

One of the notable attacks of the year, mention of which has been made by several correspondents in Western Ontario, has been that of "Grasshoppers" or more properly Locusts. Their injuries have been most serious in those parts of Ontario which have suffered from a lack of rain. They are also mentioned several times in British Columbian correspondence. In Ontario and Quebec the species of which I have received most specimens, was the common Red-Legged Locust.

Occurring with this, however, were many specimens of the Lesser Migratory Locust (*Melanoplus atlanis*, Riley) and the large green Two-striped Locust (*Melanoplus bivittatus*, Say).

Special complaints were made of Locust injuries to oats by many correspondents. Major Lloyd, of Oakville, Ont., and Mr. G. C. Caston, of Craighurst, Ont., speak of their damages in turnip fields, and records of their injuries to vegetation in general were frequent; the following extracts will give some idea of the losses due to these pests:—

"There is almost universal complaint of the damage to the oat crop by grasshoppers. Four-fifths of the correspondents from the Lake Erie counties refer to them. From Lambton, Simcoe, Middlesex, Northumberland and Durham, Prince Edward, Lennox and Addington, and Frontenac, come reports of great destruction to every thing growing in the fields. Correspondents report them more numerous and destructive than for many years."—*Bull.* 47, *Ont. Bureau of Industries, Aug.*, 1893.

"Oats this season are a light crop, owing to the prevalence of rust and the prevalence of grasshoppers."—*Bull.* 48, *Ont. Bureau of Industries, Nov.*, 1893.

"August 15.—I remember seeing in some pamphlet when at Ottawa a description of a machine used in the North-west for destroying grasshoppers; can you let me know how this is made and used. The fact is these insects are becoming a perfect pest in many parts of Ontario, and if something is not done to at least thin out their numbers, the injury to vegetation will be very serious. They have done, I am told, very great damage in the neighbourhood of Woodstock, and the country round there, and out at my place at Lake Simcoe, my neighbours, as well as myself, have suffered not a little. Last autumn I was very careful to have all the stubble and the long grass round the sides of the fields cut close, so as not to leave them any harbourage or place to deposit their eggs, but they are this year more numerous than ever. If you can suggest anything that we can do to lessen the evil, I shall be very much obliged if you would drop me a line. If they go on increasing, farming in Ontario will suffer a heavy blow."

"August 19.—The grasshoppers, now that the grain is all in, are turning their attention chiefly to the kitchen garden, where they are playing havoc with everything, and there does not seem to be any effectual method of fighting them."—HON. G. W. ALLAN, *Toronto, Ont.*

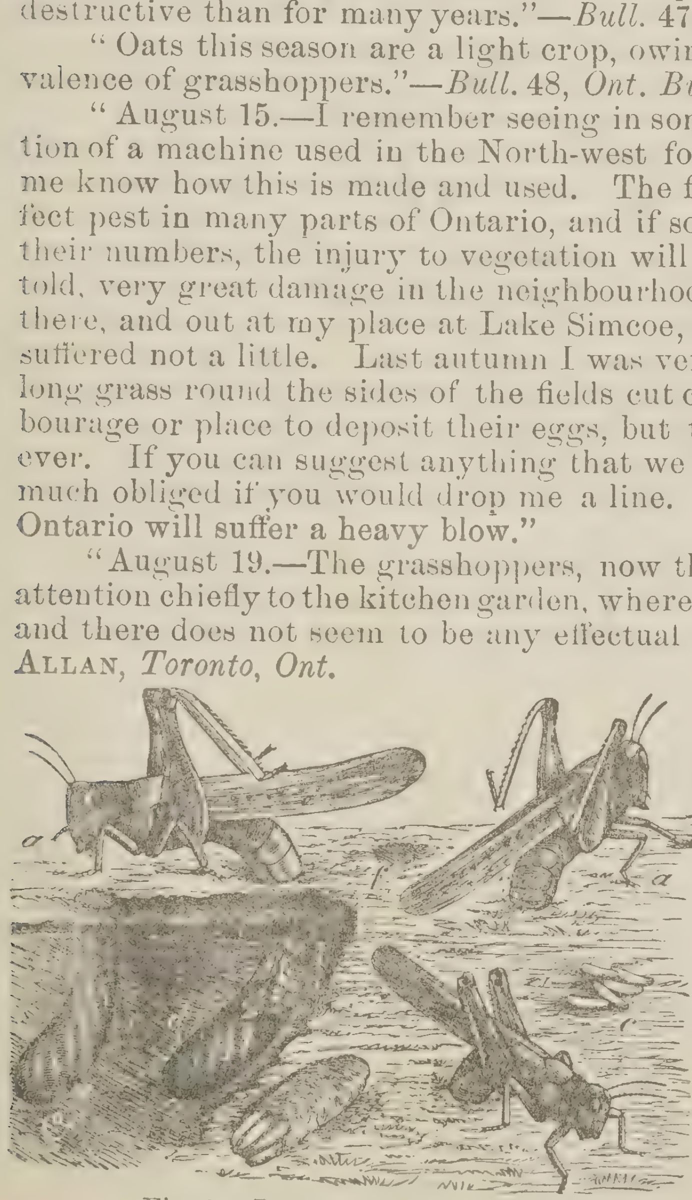


Fig. 7.—Locusts laying their eggs.

The life history of the Red-legged Locust is briefly as follows:—It is single-brooded. The eggs are laid in the autumn but hatch only the following spring. The young pass through five successive moults, attaining their full growth in July, when they have well developed wings. The females deposit their eggs in symmetrical masses called pods within burrows bored with their abdomens; each female lays 3 or 4 pods of eggs before she dies, each pod containing about 30 eggs. Prof. S. A. Forbes says:—"They select by preference for oviposition hard and dry ground, roadsides and pastures being

especially favourite localities. Meadows and pastures are commonly resorted to by the mature females, especially the latter, as the eggs seem not to be laid ordinarily on ground covered by luxuriant vegetation. I have never known them deposited in cultivated earth. The food habits of these locusts are extremely simple, and consist in eating nearly everything coming in their way."

THE LESSER MIGRATORY LOCUST is a very widely distributed species which frequently becomes injurious on account of its excessive increase. It is more nearly allied to the Rocky Mountain Locust than to the Red-legged. It is about the size of the latter, but, like the former, has longer wings and, although to a lesser degree, is migratory in its habits. This is the species to which probably most of the locust injury in Canada should be attributed, as it is a common species from British Columbia to the Maritime Provinces, and Prof. Lawrence Bruner says:—"It is the species which most frequently does the locust injury in the New England States, much of that in the Northern States, and some of that in the extreme North-west. It has also been known to become injurious in the Middle and Southern States. In its distribution this species seems to be more partial to hilly or mountainous country, and especially is this noticeable in reference to its appearance in destructive numbers. It seems also to prefer wooded or mixed country to the open prairies or plains."

The Lesser Migratory Locust is about the same size as, and closely resembles the Red-legged Locust, and, as its range is practically the same, it is impossible to separate the injuries of the two in the reports received. The two species may, however, be easily distinguished by the entomologist, from the fact that the prosternal spine of *M. atlanis* is sharply pointed, while that of *M. femur-rubrum* is spatulate or enlarged at the apex.

THE TWO-STRIPED LOCUST is the large common olive-green species with heavy body and two light stripes down the back, which is frequently found in gardens and about the edges of fields. It occurs from the Atlantic to the Pacific and from the Gulf of Mexico to the Saskatchewan. Prof. Bruner says of it:—"Its increase in destructive numbers appears to be confined chiefly to the regions lying between the Rocky Mountains and the Atlantic. This locust appears to vary considerably in size and colour. There are, however, two well defined forms, the one receiving the name *bivittatus* and the other going by that of *femoratus*, the latter occurring only northward."

The large amount of damage annually wrought by locusts is seldom appreciated. Their habits are to frequent grass lands, where a large proportion of the crop may be consumed without making much difference in the appearance of the fields. It is only after hay is cut, or in seasons of unusual drought, that locust injuries are much noticed. If, however, their numbers at all times and their voracity are considered, it will at once be seen that they must every year destroy much produce. They do not develop wings until July, and previous to that they pass most of their lives low down among the stems of grasses. Besides locusts, there are many other grass feeding insects which every year levy a heavy toll unnoticed. These may all be to a large measure controlled by the use of machines called "hopper-dozers," or "tar pans," which were invented in the west some years ago at the time of the so-called "locust invasions." Prof. Herbert Osborn, of Iowa, writing on means of destroying grasshoppers, says:—"In meadows and pastures we believe the use of the hopper-dozer the most practical plan that can be recommended. In many cases it can be used to capture these and the leaf-hoppers at the same time, especially if used when grasshoppers are still quite small and can be held by a thin layer of coal tar used on the simple flat sheet of iron. When larger they need a deeper layer of coal tar, or a pan of water with a covering of coal oil on it. A cheap and simple plan for this purpose, costing but from $1.50 to $2, was described many years ago by Prof. Riley. It consists of a strip of sheet iron 8 or 10 feet long, turned up 1 inch in front and 1 foot behind, with pieces soldered in at the ends (or made of wood), and hooks placed in front at the ends for the attachment of ropes. If to run on rough ground it will be better to put runners 1½ or 2 inches high underneath. Into this put a layer of coal tar half an inch deep, or water and kerosene. It can be drawn by a boy at each end, or by horse power if preferred."

"To treat pastures and meadows for grasshoppers and leaf-hoppers, it would seem from present experience the best plan to run over all grass lands early in May with the simple dozer described for leaf-hoppers (a piece of sheet iron 8½ feet long and 2 feet wide, was coated on the upper side with coal tar, and lying flat on the sod was dragged along by means of three cords, one fastened at each end and one in the middle). Pastures should be treated a second time about the middle of June. For meadows, the second treatment may follow hay cutting, if insects are abundant, and then if grasshoppers appear in July in numbers, resort to the deep hopper-dozer described above." (*Bull.* 14, *Iowa Ag. Exp. Station*, p. 176.)

Summarizing the results of his experiments with leaf-hoppers, the same writer says:—"Experiments with hopper-dozers for grass leaf-hoppers show that this method can be used very successfully in capturing the insects, that the simplest form, a flat sheet of sheet iron was most satisfactory, that one application resulted in adding 34 per cent to the crop of hay on a plot experimented on, and in one experiment leaf-hoppers were captured at the rate of 376,000 per acre."

These results are most striking, and one cannot but feel convinced that it would pay well to adopt systematically such a simple and cheap method of freeing pastures of the myriad insects which reduce the yield every year.

The use of hopper-dozers in the Western States for the destruction of locusts is recognized as one of the standard methods of fighting these injurious insects, and has been attended with marked success. The other method which is relied on is ploughing the land where the eggs have been deposited, so as either to bury them deeply, so that the young cannot emerge in spring, or so as to expose them under unnatural conditions, to the frosts of winter or their numerous predaceous enemies. In the thickly settled portions of Canada where as a rule stubble fields are regularly ploughed up before winter, we as a consequence do not suffer from locust plagues so frequently as is the case in the west.

The use of insecticides such as Paris green for locust attacks is seldom a practical remedy except on limited areas. In response to some who have applied for the receipt of the bran and arsenic remedy, I extract the following from Prof. Clarence Weed's useful little work, "*Insects and Insecticides:*"—"A mixture which has been successfully employed, consists of arsenic, sugar, bran, and water, the proportions being one part, by weight, of arsenic, one of sugar and five of bran, to which is added a certain quantity of water. The arsenic and bran are first mixed together, then the sugar is dissolved in water and added to the bran and arsenic; after which a sufficient quantity of water is added to thoroughly wet the mixture. About a teaspoonful of this mixture is thrown on the ground at the base of each tree or vine (in gardens and orchards) and left to do its work."

I found by experiment that the poison works slowly but is very effectual.

GRANARY INSECTS.

When visiting the Chicago Exhibition, I was requested by the Executive Commissioner for Canada to examine the grain exposed in the agricultural trophy and to report to him whether it would be safe to distribute samples of it to farmers who had made application for it, and to use the straw when taken from the trophy for packing purposes. The following is a copy of my report:—

REPORT UPON INSECT PESTS IN THE CANADIAN EXHIBIT OF GRAIN AT CHICAGO.

J. S. LARKE, Esq.,
Executive Commissioner for Canada,
World's Fair, Chicago.

SIR,—I have the honour to report as follows with regard to my examination of the exhibits in the Canadian Court of the Agricultural Building at the World's Fair as requested by you. I examined them carefully as well as similar exhibits situated near them in the building. I found that the greater part of the injury was due to the attacks of the Grain Moth (*Gelechia cerealella*, Oliv.). The Rice Weevil (*Calandra oryzæ*, L.) and the Common Grain Weevil (*C. granaria*, L.), were also both found in smaller numbers. These were chiefly in jars of grain which had been imperfectly closed. In reply to your question whether it would be safe to use the straw of this infested grain for packing purposes and the grain for distribution, I would say that it would be safer and cheaper not to use the straw for packing, because it would be first necessary to disinfect it by inclosing it in some tight receptacle and then submitting it to the fumes of bisulphide of carbon. It would be wiser also to treat all grain required for distribution with the same chemical when, I think, there would be no danger in distributing the grain. As a matter of fact, both the Grain Moth and the Grain Weevils are now well established in all parts of the world where the climate will allow them to propagate. In Canada this is not the case and there is no doubt that our exhibit has been infested from contiguous exhibits in the Agricultural Building. Grain distributed in Canada will do no harm because the insects will not propagate here in injurious numbers, and samples sent to southern countries, even if infested, will only take insects to those countries which already exist there.

I take the liberty of forwarding you herewith a copy of my report for 1889, containing an article upon Granary Weevils. See pages 71-83. I have marked one or two passages, giving a description of the method and apparatus necessary in disinfecting grain, to which I would draw your attention. I may mention that Mr. Chittenden, a member of the entomological staff now in charge of the United States Government exhibit at Chicago, has been making a special investigation of these Granary Weevils and other pests to be found in the exhibits now at Chicago. Prof. Riley the United States Entomologist, by whose instructions this investigation is now being made, will also be in Chicago during this week, as Mr. Chittenden informs me he has been telegraphed for. As requested by you I called upon Mr. Buchanan to explain our position in this matter but was unable to see him until the day I was leaving, when I called again in company with Mr. Chittenden and told him practically what I now report officially to you.

OTTAWA, Oct. 13, 1893.

It will be observed that only three kinds of insects were mentioned in the above report. But Mr. F. H. Chittenden of the United States Division of Entomology, who was specially charged by Prof. Riley with the work of examining the food products exhibited at the Exposition, for the purpose of investigating the nature and ravages

of any insects which might be found, made observations upon a much larger number of species. This investigation was undertaken as a precautionary measure in case some dangerous enemy might be introduced, and Prof. Riley announces his intention of issuing a bulletin on the subject, covering at the same time other information on insects affecting stored products.

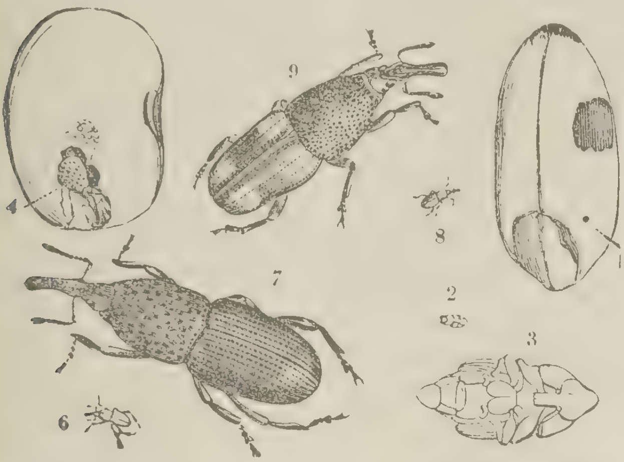


Fig. 8.—9 Rice Weevil. 7 Common Granary Weevil.

The three insects mentioned above occasionally cause slight damage to stored grain in Canada, but they cannot be considered as serious enemies. THE GRANARY WEEVILS belong to two species, the Rice Weevil, Spotted Weevil or Black Weevil of the South (*Calandra oryzæ*, L.) and the Common Granary Weevil (*Calandra granaria*, L.) These are small, dark coloured, narrow beetles rather more than $\frac{1}{8}$ of an inch in length, with their heads prolonged into a slender snout. These insects, both in the grub state and as perfect beetles, sometimes destroy considerable quantities of grain in granaries. The eggs are laid in holes which the females bore in dry grain with their slender beaks. After hatching, the young grubs feed on the contents of the kernel where the egg was laid, complete their growth and turn to beetles inside the same grain, which does not show any sign of injury until the beetle emerges, when it is found that the greater part of the inside has been consumed. The beetles themselves do even more harm than the grubs, for they also feed on the grain and live for a long time, so that in hot climates, when grain is kept in store for a length of time, the injury may be considerable; but in Canada the cold of our winters stops the development and destroys the mature beetles if exposed to it.

THE GRAIN MOTH (*Gelechia cerealella*, Oliv.). This insect is better kown as the Angoumois Grain Moth but is also called in the South, the Fly Weevil. It has been treated of by various entomologists. Prof. Howard E. Weed (*Bulletin* 17, *Mississippi Exp. Station*) says:—"The first extensive account of the habits of this insect was given in 1736 by Réaumur, a French naturalist, who found it very destructive to barley at Luçon (France). In 1760 it was very destructive to wheat in the Province of Angoumois, and Harris states that, 'The afflicted inhabitants were thereby deprived not only of their principal staple wherewith they were wont to pay their annual rents, their taxes and their tithes, but were threatened with famine and pestilence from the want of wholesome food.' Two members of the Paris Academy of Sciences were commissioned by the French Government to visit the province of Angoumois to investigate the habits of this insect and since the publication of their report the insect has received the popular name of the 'Angoumois Grain Moth.' The first record of the appearance of this insect in America was in 1768."

The Grain Moth has never developed in Canada even to the same extent as the Granary Weevils, although occasional instances of its occurrence have been brought to my notice. In the Southern States, where it is very abundant, the moths fly from the granaries and lay their eggs upon the ripe grain in the fields; the eggs or young caterpillars are thus carried back into the granary and great loss frequently ensues. This never takes place in Canada. The small eggs are deposited in groups of from 15 to 25, generally upon the underside of the grain or in the crease of the kernel. They are white at first, turning pink before hatching. The young caterpillar is only a millimetre in length, pink, slender and covered with long hair. As a rule, only one enters a kernel, where it remains until full grown, when it is about $\frac{2}{5}$ of an inch in length and dirty white in colour. It then changes to a brownish chrysalis, from which subsequently the small moth issues. This is rather larger than, but at first sight very much like, the Carpet Moth (*Tineola bisselliella*, Hum.) The wings expand about $\frac{1}{2}$ inch, are of a satiny cream colour and bear a few dark spots on the forewings, which are narrow, pointed and fringed. The hind wings are darker,

and have much wider fringes. Prof. Weed states that there are at least eight generations in a year in Mississippi, but that doubtless there are only two in the Northern States, as recorded by Harris.

Since the appearance in the press of notices of the infestation of the grain at Chicago, specimens of various insects injurious to stored grain, have been sent in, as well as those mentioned above, with inquiries as to the best way of treating them: (1) The Lesser Grain beetle (*Silvanus Surinamensis*, L.), a small, flat, brown, beetle with very narrow body and short legs, $\frac{1}{12}$ of an inch in length. This insect is easily recognized by the saw-like edges and three prominent ridges of the thorax. This was sent in large numbers from a store-house in Toronto. (2) The Least Grain beetle (*Silvanus advena*, Walt.), found abundant in flour at Ottawa. (3) The Meal Snout Moth (*Asopia farinalis*, L.), from several places; and (4) *Ptinus fur*, L., a small brown beetle, somewhat oval in shape with long slender antennæ, which was received from Orillia and Toronto as occurring abundantly in flour. This insect attacks numerous specimens of plants and insects in collections, and it is there probably where its ravages have attracted most notice, but the small yellowish curved larvæ about $\frac{1}{8}$ of an inch in length, doubtless feed on many dry substances of animal or vegetable origin.

Remedies.—Should grain at any time be found to be infested by any of the above pests, they may all be treated in the same manner. The surest remedy is to subject the grain to the vapour of bisulphide of carbon. This chemical vaporizes when exposed to the air, and the vapour is so much heavier than air that it will run down through the mass of any grain upon the top of which it has been placed, and will destroy all contained insects. The quantity required is small, 1 lb. being enough for each ton of grain. The method of using it, is to inclose the grain in a perfectly tight bin, then pour some of the bisulphide into a shallow vessel, and place it on the top, keeping the bin tightly closed for forty-eight hours. The bisulphide does not injure the grain, but it must be used with care, on account of its extreme inflammability. The grain should then be emptied out, out of doors, and no flame, lighted cigar or pipe, must be brought near it, or an explosion will occur. In large quantities bisulphide of carbon costs only about 20 cents a pound.

With regard to the treatment of mills Prof. Weed writes as follows:—"To destroy insects infesting mills, quantities of bisulphide should be placed in open dishes or plates in various elevated parts of the mill, commencing the application in the basement and going upwards. The mill should then be closed as tightly as possible, and a watchman employed to see that no lights are brought near until the odour of the bisulphide has passed off. If a mill is thus treated on Saturday afternoon, work can be resumed as usual on Monday morning. The bisulphide should not be applied to unpainted floors or walls, as it will sink into the wood and it will take some time before the fumes will have passed away." (*Bull.* 17, *Mississippi Exp. Station*, p. 14.)

ROOT CROPS.

TURNIPS.

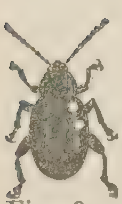


Fig. 9.—The Turnip Flea-beetle.

With the exception of Locusts in Western Ontario, the insect enemies of root crops do not appear to have been so noticeable last season as usual. The only complaints of the attacks of the TURNIP FLEA-BEETLE (*Phyllotreta vittata*, Fab.), were received from a few localities in New Brunswick, Eastern Ontario and Quebec. The single report from British Columbia was: "There are no Flea-beetles this year." This well know pest is shown very much enlarged at Fig. 9. The remedy recommended, and found successful in all instances but one, was dusting land plaster or ashes and Paris green (50 lbs. to 1) over the young plants early in the morning. In the instance of failure referred to, I found that the ashes and Paris green had been mixed and carried to the field in the evening and left

exposed to the dew till the next morning; consequently, when applied, it did not remain on the leaves because it was not, as it should have been, perfectly dry, so as to fall upon the plants as a fine powder, when it would have remained on the seed leaves and had the desired effect.

The North-west Red Turnip-beetle (*Entomoscelis adonidis*, Fab.), treated of fully last year, was much less abundant than previously, only one lot of specimens having been received, and these came without the address of the sender. Mr. J. A. Smith writes from Saskatoon: "I have seen none of the Red Turnip-beetles this season. Crop prospects good." Mr. Thomas Copland, of the same place, however, observed a few, and has been fortunate enough to discover the native food plant. He writes: "July 6.—*In re Entomoscelis*, the beetles made their first appearance here on 17th June. I send you specimens of their wild food plant, which is a common weed. I have found them feeding a little on other weeds, but the kind sent is their chief wild food. This year the beetles are attacking cabbages. I intended to sow no turnips or radishes, so as to starve them, but I have sowed some a few days ago to poison them on." The plant sent by Mr. Copland was the Small-flowered Prairie Wallflower (*Erysimum parviflorum*, Nutt.), which, like the turnip, radish and cabbage, belongs to the Cress family.

The Turnip Aphis is mentioned in the Ontario Crop Returns for November, as having injured the turnip crop. Specimens were sent to me from Ottawa by Mr. Thomas Nicholson, which had infested his Swede turnips. This is a troublesome insect to treat, but successful experiments have been made with Kerosene emulsion in a crop where the injury was restricted to small areas. This is usually the case when the attack first begins, and the presence of the insects as a rule can be detected if looked for during the operations of thinning and cultivating the turnips.

POTATOES.

The Colorado Potato-beetle (*Doryphora 10-lineata*, Say) has been noticeably less prevalent this year in Eastern Ontario than usual, probably owing to the wet season. In Western Ontario, in the sections where drought was felt, it was abundant and very injurious, particularly to egg plants. In the Maritime Provinces also it was plentiful. It is only of late years that this insect has extended its ravages into Nova Scotia and Prince Edward Island, and the farmers there have not yet learnt fully the value of Paris green in destroying it. In June last the *Gold Hunter and Farmer's Journal* of Caledonia, N.S., wrote: "Kindly send formula and directions for using Paris green for exterminating potato bugs. Our people are sorely pestered with them, but are afraid to use Paris green."

Reply: "The proper and only practical remedy for the Colorado Potato-beetle is Paris green used in the proportion of 1 lb. to 160 gallons of water, that is, 1 oz. to 10 gallons. There is no necessity to use it stronger, and with ordinary care, there is not the slightest danger in employing this material as an insecticide. Of course, it is a poison if eaten by animals or human beings, and, therefore, must be kept in a safe place and not used carelessly." It can also be used as a dry application: 1 lb. of Paris green may be mixed with 50 lbs. of perfectly dry land plaster, air slaked lime, common flour or sifted wood ashes.

The Colorado Potato-beetle has never done much injury in Manitoba. Mr. Richard Waugh has referred to it occasionally during the last four or five years; but speaks of it as a minor pest only of uncertain occurrence. During the last season, however, it seems to have rather increased. Mr. W. G. Fonseca writes, "August 9. The Colorado bug has been invading this province by slow measures for three years past. This season has seen the invaders in increased numbers, nearly all my potatoes have disappeared. Tens of thousands have been destroyed. They are now fully winged, and there is danger of their spreading."

In addition to the ordinary Colorado Potato-beetle, the Cucumber Flea-beetle (*Epitrix cucumeris*, Harris), was the cause of considerable injury to potatoes by perforating the leaves. This occurred in many localities from Ontario to New

Brunswick. Specimens were also received of two kinds of BLISTER BEETLES, with notes of their attacks upon potatoes. *Epicauta Pennsylvanica*, DeG., was received from Mr. E. Walker, of Tuscarora, Ont., which was eating the leaves of potatoes and mangels in his neighbourhood and doing a great deal of damage on account of its abundance. The same insect was received from Mr. F. Mitchell, of Innerkip, Ont., with this statement: "I send you by mail specimens of a most destructive beetle, which has this season come upon us in myriads; they are by no means local, as they extend southward as far as Baltimore, Ont., at least; for in reports from there, I find that florists there are suffering loss to the same extent as myself. They devour the petals of almost every kind of flower. Can you inform me what they are?" The same beetle came also from Mr. A. Mackay, Indian Head, as a depredator on beans. My reply to Mr. Mitchell was:—"The insects sent with your letter are the Black Blister beetle, and I have had them sent in from several places. These beetles seldom occur in large numbers for more than one season, and I think it is unlikely that you will be troubled again next year. They are not, however, an unmixed evil, for in their grub state they live as parasites on the eggs of locusts and grasshoppers. I know of no remedy which you could apply for the protection of your asters. When they attack garden crops, as beets, mangels, potatoes, &c., dusting the plants with Paris green and plaster, 1 pound to 50, has been found successful. This, however, would not do for flowers, and the only thing which occurs to me is to sweep them off the plants by means of a hand-net mounted on a short handle."

Mr. Walker was advised to use Paris green in the same proportions, or for a liquid application to mangels, 1 pound in 100 gallons of water, in which had been previously dissolved a pound of soap. The latter must be added so as to make the solution adhere to the leaves of such plants as mangels, turnips, cabbage, etc.

The other Blister-beetle mentioned was the Gray Blister-beetle (*Macrobasis unicolor*, Kirby), of which Mr. A. Laperrière writes from Entremonts, Lake Temiscaming:—"I have just found a black beetle in great numbers in my field of potatoes, which they are devouring voraciously, leaving only the stems. I have not heard of it in other places, but here and on my son's place, it is causing much havoc, and seems to work much more quickly than the old yellow striped Potato-beetle." The habits of this beetle are very similar to the Black Blister-beetle, and like that species, it feeds upon a variety of plants. It may frequently be found in the woods feeding upon the Tall meadow rue (*Thalictrum Cornuti*, L.) and Leguminosæ.

FODDER CROPS.

Fodder crops have been exceptionally good in Canada this year, and very few complaints have been received of either fungus or insect injuries. The new fodder plant, the English Horse bean, rcommended by Prof. Robertson, the Dominion Dairy Commissioner, has been largely grown for mixing with Indian corn and the heads of sunflowers in the preparation of a complete ensilage; and the few reports of injury to fodder crops have been in connection with this plant. The small white BEAN LEAF-HOPPER (*Empoa fabæ*, Harris) has occurred in several places and done much injury by puncturing the leaves and causing them to turn black and wither. As the beans were grown this year mixed with the corn, it was difficult to treat this insect at the time it appeared, in the middle of August. The most satisfactory remedy for the leaf-hoppers is to spray the infested plants early in the season before the insects have developed wings, with Kerosene emulsion. Should this pest become numerous, it will be necessary to watch for its appearance and spray the crop, while the insects are in their larval condition when they have no wings.

BLISTER-BEETLES have also infested beans to a serious degree in some localities, as shown by the following:—

"July 1.—I am mailing you under separate cover a number of beetles (these were the Western Blister-beetle, *Cantharis Nuttalli*, Say) that have proved very destructive to our beans. The specimens were handed to me by Mr. R. Norton at Brandon.

Ashes appear to drive them away for a time. They eat the plants right to the ground."—S. A. BEDFORD, *Brandon, Man.*

"July 6.—*Cantharis Nuttalli* made its appearance on my beans on June 19, but we have had no such immense numbers of them as last year yet."—THOMAS COPLAND, *Saskatoon, Sask.*

"July 7.—I inclose you a few insects that are doing considerable injury in the North-west this year. They attack the Siberian pea tree (*Caragana*), beans, tares and peas, and in other places garden vegetables. I have used Paris green with good effect. Last year a few were found in our tares; so far this is the only pest that has troubled us much this year. It seems to especially appreciate Prof. Robertson's horse-beans."—ANGUS MACKAY, *Indian Head, Assa.*

The insects sent were *Cantharis Nuttalli* and the Black Blister-beetle (*Epicauta Pennsylvanica*, DeG.). It was probably the latter which was referred to as attacking garden vegetables.

"July 4.—I send you to-day some insects, and shall be very much obliged for any information you can give me about them; they have appeared on my horse-beans which I have planted with corn. They eat the leaves only, beginning on the outer edge and leaving the stalks and veins of the leaves. They have appeared on a spot three or four rods square. I do not think they breed on the plants. If these are likely to prove destructive, please tell me what I must do to destroy them. They do not eat the corn which is planted in the same hill as the beans."—PERCY G. MILLS, *Sussex, N.B.*

The insects sent by Mr. Mills were the Gray Blister-beetle (*M. unicolor*, Kirby).

The remedy recommended for blister-beetles on beans in my report last year is as follows: "In looking over all the reports received I find that they are all dated in July, so that the time of injury to this crop will seem to be limited to a few weeks, and if a sharp watch were kept for their appearance, the ravages could be controlled, either by sweeping the crops with a net mounted on a handle or by beating the beetles into a pan containing some water with a little coal-oil on the top. When the area attacked is too large for this, spraying promptly with Paris Green, 1 lb. to 100 gallons of water (or dusting with 1 lb. of Paris green to 50 of flour) would destroy them."

VEGETABLES.

Garden vegetables in Eastern Ontario this season have not suffered very severely from insect enemies, although the abundance of some has made up for the non-appearance of others. The root maggots of the cabbage and onion were very destructive. In the case of the cabbage, experiments with Kerosene emulsion and Hellebore tea poured round the roots of infested plants were to a large measure successful. The Onion Maggot was also experimented with by sowing common salt along the rows and in the bottom of the drills: the results were conflicting, but on the whole quite encouraging, and it is proposed to continue the experiments next year.

Cabbages this year in Eastern Ontario had an almost entire exemption from the attacks of the Imported Cabbage Butterfly (*Pieris rapæ*, L.).

Beans were damaged in many places during June by Cut-worms of several kinds, *Carneades ochrogaster*, Gn., being the most generally distributed species. This caterpillar has a very wide range of destruction, specimens having been received from Cape Breton to Calgary, Alta. The protection of freshly set out herbaceous plants by wrapping a small piece of paper around the stems has been highly commended by several to whom this remedy had been suggested. Celery was received which was heavily infested late in the season by an Aphis. It was too late, the crop having been dug, to apply the usual remedies for plant lice.

Tomatoes were injured in some places by plant bugs and a report was received from Mr. W. G. Baylay of Ottawa, of the girdling of the main stem by the Buffalo Tree-hopper (*Ceresa bubalus*, Fab). The insects were, however, fewer than when he recorded the same damage in a previous year. The Tomato Stalk-borer (*Hydrœcia cataphracta*, Grt.) was somewhat prevalent in the Ottawa district, the larvæ being

found in the stems of hollyhocks, sunflowers and other succulent herbaceous plants as well as of tomatoes.

Some imported fruit of early tomatoes was sent in from Mr. W. E. Saunders, of London, Ont., containing specimens of the larvæ of the Corn or Boll-worm (*Heliothis armiger*, Hbn.). These had been imported from the United States by Mr. E. West, florist of London, who stated that he had found over a dozen in each crate of tomatoes. Although *Heliothis armiger* occurs in Canada, I have never in this country seen this injury to tomatoes in the field, which is well known in the States.

The Tomato Sphinx (*Protoparce celeus*, Hbn.) was reported as rather abundant in central Ontario, but the actual damage by this large conspicuous insect was slight. A few inquiries were as usual made as to any danger from being stung by the caterpillar when hand-picking it. This, of course, as can easily be ascertained, is utterly impossible; the caterpillar is perfectly harmless.

Early planted tomatoes were somewhat injured by the Colorado Potato beetle, before the potatoes came up. This beetle also is so much attracted by the egg-plant, as to render it almost impossible to grow this vegetable in many parts of Ontario without covering the plants.

ANOTHER VEGETARIAN CARRION BEETLE
(*Silpha bituberosa*, Lec.).

Attack.—Shining black, very active, grubs, ¾-inch in length, like wood lice, which devour the leaves of pumpkins, squashes and plants of the Spinach family.

A new attack of some interest recorded this year for the first time is that of the larvæ of one of the native carrion beetles upon plants of the Gourd and Goosefoot families in the North-west Territories. In Europe a very similar insect belonging to the same genus is sometimes a serious pest in mangel and beet-root fields. As these last-named plants also belong to the same large family, the *Chenopodiaceæ* or Spinach family, it is not impossible that as the North-west is settled up, this new pest may become troublesome, and it is fortunate that its habits have been found out before it does so. My esteemed correspondent, Mr. Thomas Copland, who has assisted me frequently with his careful and reliable observations, when on the look-out during the past summer for the larvæ of the Red Turnip beetle, found larvæ of the Carrion beetle mentioned. He writes from Saskatoon, N.W.T.:—

"June 5th.—I inclose you a few larvæ which I suppose may be those of *Entomoscelis adonidis*, and, as I am not acquainted with the weed on which they were feeding, I inclose some with the larvæ for them to feed upon on the way and for you to identify. These insects are very active in hunting for their food if they happen to be where weeds are few and cultivated food has not yet been supplied in the gardens and fields. It is possible I may be wrong in the identity of the larvæ."

"June 17.—I send you two more plants of the weed on which I first found the larvæ of the Carrion beetle (which I thought might be those of the Red turnip-beetle when I sent them). The plants sent were the favourite food of the larvæ: but they by no means confined themselves to these. The common lamb's quarters or pig-weed (*Chenopodium album*, L.) and several other weeds were eaten, but not quite so freely as the specimens sent. The larvæ are remarkably active and drop from the food-plants when disturbed, hiding under them or seeking crevices in the ground. I will let you know if they attack any cultivated plants. I have heard of similar, probably identical, larvæ attacking the young squash vines; but, as our vines are inclosed, I cannot say whether they are liable to attack or not."

The weeds sent were the wild North-west plant *Monolepis chenopodioides*, Moq., which also belongs, like the lamb's quarters, to the *Chenopodiaceæ*.

Referring to the above letters, Mr. Copland wrote on July 6th:—"Yours of the 28th June is to hand. I have, since receiving it, recognized and captured a specimen of the *Silpha* beetle. I have not found the larvæ on any cultivated plants, but did observe that they were rather indiscriminate feeders, and the succulent condition of the plant seemed to have everything to do with the choice, except in the case of the *Monolepis chenopodioides*, which is their favourite; they have not yet touched my beets. I will keep a look out for a second brood."

About the same time, I received more specimens of this insect from the same place from Mr. Geo. L. Smith :—

"June 17.—I mail to your address to-day a packet containing a number of insects which I discovered to-day eating my squash and pumpkin vines. Some of the vines they had almost destroyed. When disturbed, they drop to the ground and hide under leaves or earth. They are the first I have seen, and they have not been working, I think, more than a couple of days. Let me know what they are and give me what information you can."

When received these larvæ were nearly full grown, and when placed in a breeding jar, and provided with leaves of lamb's quarters and beet-root, fed freely upon them until ready to pupate. They fed at night and kept out of sight by day. The last date when they were seen feeding was 12th June, and on 24th the first fully developed beetle appeared. The pupæ were white and were found in little cells about 3 inches beneath the surface of the ground.

The larvæ are entirely black, shining, from $\frac{1}{2}$ to $\frac{3}{4}$ of an inch in length, rounded above, flattened beneath, $\frac{1}{5}$ inch wide and tapering to each end. The body is divided distinctly at the segments like a woodlouse or "sowbug" (*Oniscus*).

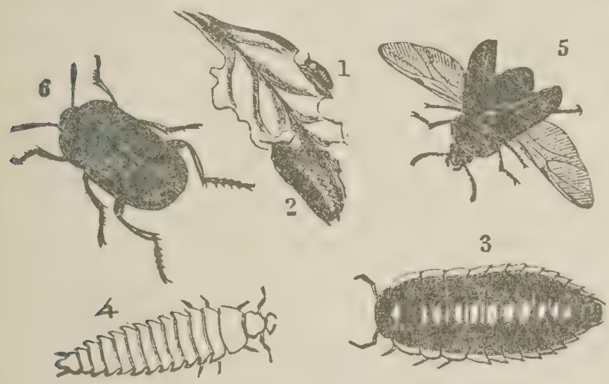


Fig. 10.—The Beet Carrion Beetle.

The beetle is dull black, flattened, having a small prominence on each wing case towards the end, and with the thorax covered with fuscous hairs.

It is in habits and appearance very much like the European Beet Carrion Beetle (*Silpha opaca*, L.), which also occurs in North America, and like that species, probably has the dual habit, both in the larval and perfect states, of feeding sometimes on carrion as well as on vegetable matter. I am indebted to Dr. George H. Horn for the identification of the imago.

These two species are distinguished as follows :—

Form elongate oval (as in *trituberculata*)..................*opaca.*

Form oval (as in *ramosa*).................................*bituberosa.*

Of the latter Dr. Horn remarks: "It is a much broader species and in form more nearly resembles *inæqualis*." In *opaca*, the middle costa of elytron is given as extending nearly to apical margin, while in the other species it does not attain the apical margin.

Curtis's figure of the Beet Carrion Beetle (Fig. 10) kindly lent by Messrs. Blackie & Son, of Glasgow, at Miss Ormerod's request, gives so good an idea of the different stages, that Nos. 1, 2, 4 and 5 might almost answer for those of *S. bituberosa.*

Remedies.—Should this insect develop into a pest of Chenopodiaceous plants such as beet-root, mangels and spinach, it will be necessary to protect the plants during the first part of June until the larvæ have attained their full growth, by dusting them with Paris green and some dusty diluent such as flour, land plaster, or ashes (1 part to 50), or in the case of spinach it may be necessary to plant a more attractive food-plant near by as a bait, to be afterwards destroyed with the infesting insects. For this purpose *Monolepis* or lamb's quarters should be tried. In the case of young pumpkins or squashes, as the season when the larvæ attain full growth is so early, these plants could be easily protected by keeping the hills covered with cheese cloth or paper after dusting the plants with the poison mixture above mentioned. It is not likely that the mature beetles will attack plants.

FRUITS.

The crop of large fruits this year has not been remarkable for excellence. In Ontario the November bulletin says :—"The August bulletin did not speak cheerfully regarding the prospective apple crop, and reports to hand are confirmatory. The Codling moth has done much injury and so have the scab and drought, hence a

considerable quantity of the unusually light yield of apples are wormy, spotted and small." In British Columbia the orchards on the mainland have been badly infested with Apple Aphis (*Aphis mali*, Fab.) and the Oyster-shell Bark louse (*Mytilaspis pomorum*, Bouché). On Vancouver Island Mr. John Tolmie reports "The fruit crop is poor this year, mainly due to heavy showers just as the fruit was forming; small fruits have, however, done well." Mr. G. A. Knight, of Victoria, B.C., also states that the Woolly Aphis (*Schizoneura lanigera*, Hausm.) is now very abundant on Vancouver Island in apple orchards, and that the Cherry-tree Slug (*Selandria cerasi*, Peck,) Fig. 11, has been this year extraordinarily abundant. This insect was also complained of to a certain extent in Nova Scotia and Ontario. At Ottawa, besides cherry trees, the larvæ disfigured ornamental hawthorns and the oak-leaved mountain ash. It is easily treated with a weak application of Paris green, or may be dusted with freshly slaked lime.

Fig. 11.—The Cherry-tree Slug.

The Shot-borer (*Xyleborus dispar*, Fab.), I fear, is again on the increase in the Nova Scotia apple orchards. Through the kindnesss of Mr. W. H. Woodworth, of Berwick, N.S., and Mr. T. E. Smith, of Cornwallis, N.S., I am in possession of a large quantity of facts as to the depredations and habits of this injurious insect, and hope, at an early date, to have more definite information as to remedies than is as yet available.

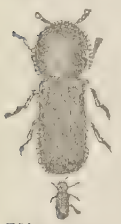


Fig. 12—The Shot-borer.

Mr. T. E. Smith sent to me from North Sydney, Cape Breton, some larvæ which were abundant there upon apple trees. These, when received, had spun their cocoons; of which specimens were submitted to Prof. J. A. Lintner, and he reports: "There is hardly a doubt but that the little cocoons sent me are those of *Micropteryx pomivorella*, Pack."

The Red-humped Caterpillar of the Apple (*Œdemasia concinna*, Sm. & Abb.) was rather abundant upon young apple trees at Ottawa, and specimens were also sent by Mr. E. Hutcherson from Ladner's Landing, B.C. These are the first specimens I have seen from British Columbia.

The curious caterpillars of the Unicorn Prominent (*Cœlodasys unicornis*, Sm. & Abb.) and of the Hag-moth (*Phobetron pithecium*, Sm. & Abb.) were sent as apple insects by Mr. W. J. Kerr, from Smith's Falls, Ont.

A pest which I found to be very abundant in the peach orchards round St. Catharines was the Peach Bark-beetle (*Phlœotribus liminaris*, Harris). This was first brought to my notice by Mr. C. E. Fisher, of Queenston, and I have later received specimens and facts bearing on the life history both from that gentleman and Capt. James Sheppard. Some experiments which are being carried on to control this insect are not yet completed, so a report upon them is deferred for the present.

Most of the fruit insects reported this year have been enemies of the apple.

The Apple-tree Aphis (*Aphis mali*, Fab.).—From British Columbian reports this insect is committing serious injury in the apple orchards. In the East it is seldom that this insect develops in sufficient numbers to be ranked as a first class pest, but this season a large number of reports have been received from British Columbia complaining that even old trees had been killed. Mr. John S. Warren, in a letter to the *Orillia Packet*, gives an account of the condition of the orchards at Okanagan Mission, B.C., in which he speaks of serious loss from the Apple Aphis. Mr. J. H. Christie also sends specimens of Aphis infested twigs from the same place, of which he says: "The contents of this parcel will, I think, be somewhat of a surprise to you. The twigs sent were cut from three different orchards from trees six to eight years old, and you will have a better idea of the state of affairs here when I tell you that several ten to fifteen year old trees have been destroyed during the last year by Aphis. Large

Fig. 13.—The Apple Aphis.

magnificent trees now stand blackened and disfigured monuments of the negligence of the owners. This appears to be a new pest, trees of the old-timers never having suffered before." Mr. G. M. Kinnear, of Ducks, B.C., also sent specimens of Apple Aphis with report on their serious injury to his trees.

Late in autumn the females of the Apple Aphis lay small black eggs on the twigs of the apple trees. These eggs do not hatch until the following spring. In *Insect Life* (vol. VI. p. 152), Prof. F. M. Webster, of Ohio, announces the important discovery that in the autumn this insect also migrates to fall wheat, where it propagates enormously and does much harm. Perfect females then return to the apple trees to deposit their eggs. The most satisfactory remedy I have found to be the Kerosene emulsion which should be sprayed on the trees early in spring just when the leaf-buds are bursting. As large numbers of eggs are frequently laid on the trunks of trees, these should also be well sprayed.

Fig. 14.-The Oyster-shell Bark-louse.

THE OYSTER-SHELL BARK-LOUSE (*Mytilaspis pomorum*, Bouché) is probably the worst pest of the apple tree, concerning which this year, as well as every other year, there has been much inquiry from every province of the Dominion. The life history of this insect is remarkable. About 1st of June, minute white, mite-like insects with six legs, emerge from beneath the scales on the bark, and for two or three days, during which alone of their whole lives they have the power of locomotion, run about over the twigs seeking for a suitable place to attach themselves. They then pierce the young bark with their beaks and live on the sap of the tree. They never move from that place again. Each gradually secretes a waxy mantle and by August has transformed itself into a scale covering a cluster of eggs. These remain unchanged through the winter, and the young do not hatch until the next June.

Remedies.—This insect, like many others, thrives most on unhealthy trees. When detected, therefore, measures should be adopted for inducing a vigorous growth as well as for the removal of the scale insects. Spraying just before the buds open with the Kerosene emulsion will destroy many of them; but the best time, which will vary slightly in different localities, is when the young lice are active, for they are then most susceptible to injury. Prof. A. J. Cook, of Michigan, says that no fruit grower or lover of shade trees can afford to be ignorant of the Carbolic acid emulsion. He writes: "I make it just as I do the kerosene emulsion, only stronger; one part of crude carbolic acid to from 5 to 7 parts of soap solution (one quart of soft soap, or 1 lb. hard soap in two gallons of water) is of the proper strength. This is the best preparation I know of to protect against the Apple-tree Bark-lice and Apple-tree Borers. It is applied to the trunk and larger limbs by means of a stiff brush or cloth about twenty days after the trees blossom." With regard to some inquiries which have naturally suggested themselves to two of my correspondents as to how insects which only have the power of locomotion for three days or so, and then only when extremely minute, can spread so rapidly from tree to tree in an orchard, I believe the generally accepted opinion is, that this is effected through the agency of other larger insects and birds, upon which they crawl when they visit the trees, and by which they are carried to other trees.

An attack upon Apple trees which I do not think has been previously recorded from Canada is of the Otiorhynchid beetle, *Anametis grisea*, Lec. This was received from Mr. R. Z. Rogers, of Grafton, Ont., together with specimens of the way in which apple trees were injured by having the bark eaten off the young twigs. Specimens of a very similar species were forwarded from Okanagan Mission, B.C., by Mr. F. J. Watson. As these beetles are wingless and have to climb up the stems of trees attacked, any mechanical means of preventing them, such as a band of cotton batting or one of the various kinds of "tree protectors" placed around the trunks at the time when the perfect beetles are about, would prevent injury by the mature insects. In *Insect Life* (vol. IV., p. 401) reference is made to considerable damage by this beetle to young peach trees in Goodison, Michigan; the beetles hid near the surface of the ground during the day time and ate the bark and buds during the night. Similar

damage to apple trees was reported from Wisconsin in 1882. The larvæ in all probability feed on the roots of the trees.

THE MOTTLED UMBER MOTH

(*Hibernia defoliaria*, L.).

Fig. 15.—The Mottled Umber Moth.

Attack.—Slender loopers or "measuring worms," found on plum and cherry trees; 1¼ inches in length, with chestnut red heads, dark reddish brown backs, mottled with broken narrow black lines, the lowest distinct and waved; the sides bright yellow, paler beneath, including the legs. There is a dark reddish patch shaded with black, surrounding each spiracle.

Some years ago a few specimens of the Mottled Umber Moth, the well-known apple tree pest of England, were taken at Victoria, B.C., by the Rev. George W. Taylor, and since then a few more specimens have been taken by Mr. W. H. Danby of the same place. In June last I received from the latter gentleman a consignment of caterpillars, which may be described in general as above. He wrote:—

"June 20.—I send you herewith some caterpillars which feed mostly on cherry and plum trees. This species is just now rather a prominent nuisance in orchards—what is it?" In acknowledging these specimens, it was surmised that they might be the caterpillars of the Mottled Umber Moth, and Mr. Danby was requested to be on the look out for the moths. I have since received the following notes:—

"November 10.—I think you are right as to the larvæ I sent you: for I to-day caught a fine specimen of *H. defoliaria*. This moth is very uncertain in its appearance. I have seen none since the few I mentioned to you in 1889, but I expect to get more within a week or two."

"November 20.—I send you some very fine males of *H. defoliaria*. I took no less than 93 males, but only one female. This latter is quite the regular apterous female of the English *defoliaria;* but some of the males are very dark, and some very much suffused. I have as fine a series for my collection as it is possible to get. This moth occurs very rarely for a few years, and then like other pests is very common. All I took I got in one day, since which none have appeared."

"December 7.—*H. defoliaria* was wonderfully plentiful this year as compared with other seasons. During June and early in July the larvæ were a pest in most plum and cherry orchards. They seemed to prefer the plum. Apple trees growing close to plum and cherry trees were not attacked; nor can I find from such inquiries as I have made, that the larvæ were seen by any one on apple trees. I will, however, make careful observations on this point next year. The moths were very abundant in the latter half of November. The sexes seemed to average 1 female to 6 males. The electric lights proved a great attraction to the males: I collected on one morning eight dozen on the walls and doorways of two hotels, which had been attracted by the lights; and more or less were to be found for several days afterwards."

The caterpillars sent me by Mr. Danby were received at Ottawa on June 28th, and were full-grown. They pupated in a few days, most of them on the surface of the ground, but some a short distance beneath. A few specimens were parasitised by a Tachinid fly. The first moth, a male, emerged on November 27th, so that the pupal stage lasted almost five months. The pupa is smooth, dark reddish brown, nearly ⅜ of an inch in length, and has the last segment terminated with a stout spine. The male moth is of a dull ochre-brown hue, expanding 1⅝ inches, and has the upper wings dotted and crossed diagonally by two dark waved bands; the space between these is pale and bears on each wing a dark discal spot; the lower wings are paler than the upper, and like them sprinkled with brown dots and they have a dark spot near the middle. The female moth is brown with two rows of conspicuous spots down the back. The wings are almost entirely aborted.

I have to thank my good friend Miss Ormerod for the above excellent cut of this insect, which is the same as is used in her *Manual of Injurious Insects*, page 336.

The occurrence of this insect at Victoria is worthy of note, as in England it is one of the worst orchard pests, and will probably add one more to the already too long list of apple tree pests. Prof. J. A. Lintner, has already noted no less than 282 different species of insect enemies of the apple. Miss E. A. Ormerod says as to the food of the Mottled Umber Moth:—"The caterpillars are very abundant, and very injurious to the leafage of various kinds of fruit and forest trees, as oak, lime, &c. They have been especially noted as feeding at times on unripe cherries, gnawing away one side of the fruit." (*Manual of Injurious Insects*, p. 337.) The habits of this moth are very similar to those of our Canker-worms (*Anisopteryx*). When the moths appear in the autumn, the females crawl up the trunks of trees and lay their eggs on the branches. In this condition the insect passes the winter.

Remedies.—The usual remedies for the Canker-worms are applicable for this species and consist of tying sticky bandages or mechanical contrivances around the trunks of fruit trees to prevent the females from crawling up to deposit their eggs, or what will be found far more effective, spraying the trees in spring when the young caterpillars hatch, with Paris green and lime, 1 pound of each to 200 gallons of water.

An exact description of the larvæ taken from the British Columbian specimens is as follows:—

MATURE LARVA.—Length $1\frac{1}{4}$ inches. Head round, bilobed at apex, chestnut red, mottled. Mouth parts darkened, dorsal region reddish brown, darkened with fine black broken lines arranged as follows: a dorsal double stripe which widens a little in the middle of each segment and is shaded with pale yellow; two narrow sub-dorsal lines, rather indistinct, and placed on a reddish field; a double lateral stripe the lower line of which is distinct and sinuous. Beneath this dorsal area the stigmatal area is bright yellow. The spiracles themselves are white, ringed with black and are in the centre of blotches of reddish brown, shaded anteriorly with black. Ventral area including thoracic feet and prolegs, pale yellow. Some specimens are much darker than others; in the darkest there is a broken supraventral stripe just beneath the substigmatal fold, sometimes running up on to it. The prolegs on 10th segment are also sometimes darkened exteriorly.

I believe the British Columbian insect to be identical with the English, as I can find no difference between either the moths or the caterpillars.

SMALL FRUITS.

Small fruits in Ontario and Quebec have been a good crop this year, strawberries in Eastern Ontario exceptionally so, and, although various insect pests have been sent in, there are none of them which call for special mention.

THE RASPBERRY CANE-BORER (*Oberea bimaculata*, Oliv.) was abundant at Ottawa, as evidenced by the conspicuous injury on the young canes. The injury by this insect, however, I believe to be slight, if the grub be prevented from boring down into the canes, as can so easily be done in June by picking off the injured tips as soon as they show by fading, that an egg has been deposited. The method of nipping back the young shoots of raspberries, at this period, moreover, is in accordance with the views of some horticulturists as to the best way of cultivating the raspberry.

Fig. 16.—Raspberry Cane-borer.

THE GOOSEBERRY FRUIT-WORM (*Dakruma convolutella*, Hbn.) is reported by Mr. B. Loiselle as abundant at Ste. Philomène, Que. The only remedy which so far can be recommended for this insect, which seems to be attracting much more attention in Canada than formerly, is hand-picking the injured fruit as soon as its premature coloration shows that it is infested.

Fig. 17.—The Gooseberry Fruit-worm, Moth and Cocoon.

THE CURRANT SAW-FLY (*Nematus ribesii*, Scop.) was as usual abundant in many places, and when neglected did much harm by defoliating the bushes. Much loss

every year is due to fruit growers not recognizing the fact that if the late summer brood of this insect is allowed to destroy the leaves, because as some say, "It does not matter now, as the fruit is all picked for this year;" nevertheless, they do suffer much in the quantity and quality of the next year's crop, which is largely fed, as in all early flowering plants, from material laid up through the leaves in the previous season. The larvæ of this saw-fly are extremely easy to destroy. The first brood appears in May and *for this first brood only* a weak mixture of Paris green ($\frac{1}{4}$ oz. to a pailful of water is sufficient) may be sprayed on the bushes, or a dry mixture of 1 oz. of Paris green to 6 lbs. of flour, well mixed together, may be dusted over the bushes after a shower, or when damp with dew. For the second brood of caterpillars, which appears just before the fruit ripens, Paris green must *on no account* be used, owing to its poisonous nature; but instead of it, white hellebore, dusted on dry, or in water, 1 oz. to a pailful of water, will be found quite effective.

Black currants were much affected by Red Spider in the districts where drought prevailed. The same pest was also very abundant on a plantation at Ottawa, where, however, it was to a large extent kept in check by numbers of one of the small Lady-bird beetles (*Scymnus punctatus*, Melsh.) (?)


Fig. 18.—Currant Span-worms and Chrysalis.

The Currant Span-worm (*Eufitchia ribearia*, Fitch) was also present in small numbers at Ottawa, and specimens were sent in from Mr. R. Bogue, of Moose Jaw, Assa., who writes: "July 5.—The inclosed caterpillars are doing much mischief on my currants. They first attacked wild bushes, later the cultivated ones. They have not touched the red and white currant bushes. They strip the leaves off, leaving only the fruit." Mr. W. F. Morden also writes from Morden, Man., concerning the same insect, stating that he had tried spraying the bushes with white hellebore, but that it had not worked as satisfactorily as he would have liked, and asking if there was a better remedy. This caterpillar is much more difficult to destroy than the false caterpillars of the Imported Currant Saw-fly, and it is necessary to use Paris green. As there is only one brood in the season, it is easily controlled. If it is considered unadvisable to use Paris green, the conspicuous yellow and black larvæ can be easily picked off by hand.


Fig. 19.—Moth of Currant Span-worm.

Strawberries have been little attacked, no report having been received of the work of the Strawberry-weevil (*Anthonomus signatus*, Say), this year. White Grubs (*Lachnosterna*) and true bugs have also only been reported as injurious to this crop in single instances.

Several kinds of the true bugs have been abundant in gardens, and have attracted more than usual notice. Mr. J. A. Morton, of Wingham, Ont., sent a box containing the Tarnished Plant-bug (*Lygus pratensis*, L.), and the Four-lined Leaf-bug (*Pœcilocapsus lineatus*, Fab.), which had been very destructive in his garden. He said: "They seem to be omnivorous, and attack currant and gooseberry leaves, and sage, also fennel, the leaves of *Cypripedium spectabile*, the common chickweed, this latter not so much as I would like, flowers of Gladioli very badly, when they shrivel, sweet corn kernels when young, if they can get at them." In replying, I suggested that the attack upon the last five plants named was by the Tarnished Plant-bug, and upon the three first by the Four-lined Leaf-bug. The former insect (Fig. 20) passes the winter in the perfect state and attacks plants throughout the season. It is a difficult insect to combat, when, as this year, it occurs in excessive numbers. It sucks the juice from the leaves and flowers of many plants, frequently injuring the young shoots


Fig. 20.—The Tarnished Plant-bug.

of apple trees and annuals in gardens, its poisonous punctures causing the flowers to become distorted. Spraying the infested plants with Kerosene emulsion, or dusting them with insect powder, are the active remedies which have been attended with most success, but these cannot be claimed to be altogether satisfactory. The cleaning up of gardens and the burning of all rubbish in the autumn, which will reduce the shelters available for the perfect insects to pass the winter, are very important. Advantage may also be taken of the fact, that although during the heat of the day these bugs are extremely active, they are comparatively sluggish early in the morning, when many of them may be destroyed by beating them off the plants into an inverted umbrella or other receptacle.


Fig. 21.—The Four-lined Leaf-bug.

The Four lined Leaf-bug (Fig. 21, natural size and enlarged,) is not injurious to as large a number of plants as the last named. It is a bright greenish yellow bug, $\frac{3}{10}$ inch in length, with two spots on the thorax, and four black stripes down the back. The presence of this insect upon plants is easily detected by the brown spots it makes upon the leaves near the tips of the branches. This injury is most often seen upon currants, gooseberries, and mint, but also on several other plants, as weigelas, dahlias, snapdragon and sage. Mr. M. V. Slingerland has lately published a very complete account of this insect, which he has made a subject of special study. He has made the important discovery that the winter is not passed in the perfect state, but in the egg state, the eggs being imbedded in the tips of shrubs. This discovery places at any rate a partial remedy within our hands, namely, cutting off the young shoots containing the eggs and burning them. Mr. Slingerland says: "On bushes which have been infested this year the egg scars can soon be found, as the whitish tips of the eggs are quite conspicuous. After a few have been found and their characteristics noted, it will take but a few minutes to look over a bush and clip off the tips of shoots containing eggs. The eggs remain in these tips nine months, thus making it practicable to do the pruning during winter months when other work is not so pressing. The leaves will then also be off, and the egg scars can be more easily seen."

Of insects attacking the grape vine, the kinds which have been most troublesome are the Grape-vine Leaf-hopper (*Erythroneura vitis*, Harris) and the Grape-vine Flea-beetle (*Graptodera chalybea*, Illig.). Specimens of the Beautiful Wood Nymph (*Eudryas grata*, Fab.) were sent to me by a few correspondents, but more as objects of beauty than as injurious insects. On the Experimental Farm at Ottawa, Mr. Craig, the Horticulturist, records unusual injury by the Large Red-headed Flea beetle (*Systena frontalis*, Fab.). Major Roland Gregory sent me twigs of grape-vines injured by the Snowy Tree-cricket (*Œcanthus niveus*, Serv.).


Fig. 22.—The Grape-vine Leaf-hopper.

The Grape-vine Leaf-hopper.—This is a well known enemy of the grape vine and Virginian creeper, and is generally spoken of among fruit-growers as the "Thrip." It is about $\frac{1}{8}$ of an inch in length, marked with red and pale yellow, as in the enlarged figure (Fig. 22). It is very active and generally occurs in large colonies, when its attacks upon the foliage are so severe that vines are frequently defoliated and the fruit is consequently destroyed. It is furnished with a sharp beak with which it sucks the juice out of the leaves, causing them first to turn white in patches and then fall from the vine. It passes the winter in the perfect state, hidden amongst fallen leaves and other rubbish. In the spring it flies to the vines and deposits its eggs, from which the injurious swarms of young leaf-hoppers hatch.

Remedies.—These consist of clean culture and the clearing away of all fallen leaves in autumn, so as to reduce as far as possible the opportunities of wintering near the vines. For this same reason the ground should be raked and kept smooth in autumn. The vines should be examined during the summer, and if the young insects are observed on the leaves, the vines should be sprayed with Kerosene emulsion before the insects reach their perfect development, when only they acquire wings and are able to fly.

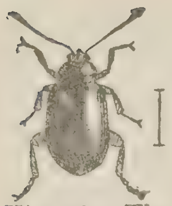


Fig. 23.—The Grape-vine Flea-beetle.

The Grape vine Flea-beetle.—This is a shining blue-black flea-beetle $\frac{1}{4}$-inch long, which sometimes appears in large numbers on grape vines when the buds are bursting, and again late in summer. The grub is of a dirty, yellowish-brown, with black shining bristle-bearing tubercles on the body. This, like the mature beetle, feeds on the foliage which it riddles with holes. Fig. 23 shows the Grape Vine Flea-beetle enlarged; the hair line at the side indicates its real length.

Remedies.—Dusting the vines in early spring when the beetles appear with Paris green and lime (1 lb. to 50), or spraying $\frac{1}{4}$-lb. Paris green to 50 gallons of water. Clean culture and the burning of all leaves and rubbish, as well as keeping the ground smooth, will prevent the mature beetles, which pass the winter in that state, from hibernating near the vines.

Fig. 24.—The Snowy Tree-cricket.

The Snowy Tree-cricket.—This is not so frequently injurious to the grape as to the raspberry, of which, however, Prof. Saunders (*Insects Injurious to Fruits*, p. 308) considers it the most troublesome enemy. The injury is committed by the female in the operation of depositing her eggs. These are laid in the autumn in long rows of punctures which weaken the stems so that they break easily. The young hatch out in the spring and feed upon other small insects. The injured twigs should always be cut out and destroyed. Fig. 24 shows the female of the Snowy Tree-cricket life-size.

The Large Red-headed Flea-beetle.—This beetle belongs to an extensive family of injurious beetles, the *Chrysomelidæ*, and is a slender beetle $\frac{1}{6}$ of an inch in length by $\frac{1}{16}$ in width at the widest part. The whole body is black and shining, with a dull red patch on the top of the head in front. The beetle was particularly troublesome last season and attacked a great variety of plants. Potatoes and horse-beans, many kinds of deciduous shrubs and particularly grapes were at times badly damaged. Mr. Craig found it very injurious to young grape vines at Ottawa. Its attacks were worst on those varieties which belonged to the thin-leaved grapes derived from *Vitis riparia*. The greatest damage was done to some young seedlings which were not trained on trellises and which had not been sprayed with fungicides.

Remedy.—Spraying infested plants with Paris green, $\frac{1}{4}$ lb. to 50 gallons water.

THE BLACK VINE WEEVIL

(*Otiorhynchus sulcatus*, Fab.).

Attack.—Snout beetles, three-tenths of an inch in length, black, spotted with white, which attack foliage of various plants. In the larval state, yellowish white grubs, with head darker, which attack the roots. It may be specially noted as bearing on the question of remedies, that the wing cases which in most beetles are separate and cover true wings, in this family are joined together, and the beetles have no wings, so that they can only reach their food plant by crawling.

Last winter I received from Mr. G. A. Knight, of Victoria, B.C., some specimens of Coleopterous larvæ. He wrote later:—

" February 25.—I received your letter some time ago, asking for some more grubs. They are now turning into beetles, so I send them on. They are from Cyclamen plants in the green-house."

" March 31.—The weevil grubs only eat the roots of the Cyclamens and make them sickly and unsaleable. I had thrown my plants away before I received your last letter. I only grow a few Cyclamens, there being little demand for them. I raise the plants from seed every year. I think I have seen a few of these larvæ out of doors. They attack lots of other plants in the green-house beside Cyclamens.

Gloxinias and Adiantums they are very bad on, eating the roots of the Gloxinias and the young fronds close to the roots of the Adiantums."

The Black Vine Weevil is a rare insect in Canada. In the *Canadian Entomologist*, XXIII. (1891), page 72, Mr. W. Hague Harrington writes: "*Otiorhynchus sulcatus*, Fab., was found by me at Sydney, C.B., Nova Scotia, in August, 1884, and again in September last. It is apparently quite abundant, as at several points I found fine fresh specimens under boards, &c. Provancher states that this beetle is common in Quebec, and adds: 'We think that its larva lives in haws, as we have nearly always found it beneath hawthorns and apple trees.'" It may be noted that this last suggestion is erroneous, as the larvæ live in the soil and attack roots. In 1891 I received a specimen of this weevil from Mr. W. H. Danby, of Victoria, B.C., and later, as recorded above, specimens came from Mr. Knight of the same place. These are the only records that I know of, of the occurrence of this insect in the Dominion. In *Insect Life*, III., page 37, Mr. E. A. Schwarz says: "*Otiorhynchus sulcatus* occurs in both North America and Europe. In the latter country it has been frequently mentioned as an enemy to grape vines, strawberries and other cultivated plants. In North America, Dr. J. A. Lintner (*Second N.Y. Rep.*, 1885, p. 51) introduced it, on the testimony of Mr. S. Henshaw, as a species injurious to 'bulbs and house plants,' Mr. Henshaw's statement apparently referring to injury done in Massachusetts. Quite recently Dr. H. A. Hagen (*Psyche*, V., 1890, No. 167–68, p. 333) states that this species has injured Cyclamens in green-houses at Montvale, Mass., the flowers being destroyed, and in some instances the bulbs injured. As to the probable future course of this pest, we do not anticipate that its injury will be a very serious one, nor that it will spread very much. The species was already known from North America to coleopterists more than sixty years ago, and is confined to the extreme north-eastern portion of the country (from New York northward to Newfoundland and Nova Scotia). For this reason we are inclined to believe that it is not an imported species, but that it belongs (with the other species of *Otiorhynchus* known from North America) to the circumpolar fauna."

By a further note (*Insect Life*, IV., p. 222), it is shown that the weevil has a great partiality for ferns, and it is stated to be "still comparatively rare in this country. In Europe it has long been known as a pest attacking the grape, strawberry and raspberry, and Miss Ormerod records an instance of its having ravaged a field of mangel-wurzels in England. The beetle feeds at night and remains under shelter during the day. Its nocturnal habits render it comparatively easy to deal with. The larvæ are not so readily destroyed, but the beetles may be shaken at night from the plants infested by them or may be captured by what is known as the chip-trap process, both well known methods employed against the native Plum Curculio."

In the letter given above by Mr. Knight it is shown that this insect is capable of committing considerable injury in British Columbia, and it is probable that less careful observers have overlooked it.

FOREST TREES.

Forest insects have not been brought before the department very much during the past season, most of the injuries reported having been to cultivated shrubs. The most serious of these is by the WESTERN TEN-LINED JUNE BUG (*Polyphylla decemlineata*, Say) upon nursery trees in Vancouver Island. Grubs were sent by Mr. G. A. Knight, of Victoria, who had found them very destructive in his nursery. He wrote: "I send you some young plants of *Cupressus Lawsoniana* to show how plants of different kinds are attacked by these pests. They are also very bad on strawberries and young cherry trees. In fact, I know nothing that they will not attack. They are also very hard on young grafts, such as Irish yews, *Cedrus Deodara* and *C. Libani*, Araucarias, etc. There appears to be no remedy for this destruction in a nursery because the plants are dead before one knows that the grubs are at work. The only way seems to dig up the plant and kill the grub."

"March 31.—I send you some more large grubs and some small ones that I found with them. A few days ago I was digging up two rows of young plum trees raised from cuttings, and found about one hundred of the large grubs and a large number also of the small ones."

In July last Mr. Knight also sent me the larvæ, chrysalides and a perfect beetle with the following note: "Last week I was forking among the roses and I found about thirty chrysalides. I forward you some of them. The grubs are playing havoc again this season."

This large handsome beetle is $1\frac{1}{4}$ inches in length by over $\frac{1}{2}$ inch wide. It is shaped like the ordinary June-bug, is of a tawny brown appearance with four white stripes and a short dash from the shoulders on each wing case. The colour of the wing cases is really black, but they are so covered with tawny scales as to give the beetle a brown appearance. The thorax is piceous, bears three longitudinal white stripes and is covered with tawny scales. The whole of the thorax beneath is densely covered with long silky down, which also appears above as a conspicuous tuft between the thorax and the wing cases. Abdomen beneath banded with white. A remarkable character in this genus is that in the antennæ of the males, the terminal joint is very much enlarged and curved, in this species $\frac{3}{8}$ inch in length. It consists of seven plates closely appressed together. The larva from which this large beetle comes is a formidable enemy. When full-grown and stretched to its full length, it is $2\frac{1}{2}$ inches in length, by $\frac{5}{8}$ inch wide. The body is curved and white. The head pale chestnut, the mandibles black. Thoracic feet long and slender. When full grown, it forms a large cell nearly 3 inches in length by 1 inch in diameter and changes to a pupa from which the perfect beetle emerges two or three weeks later. I regret to say that for the present, I am unable to suggest any practical remedy.


Fig. 25.—Canker-worm

CANKER-WORMS, the larvæ of two Geometrid moths (*Anisopteryx vernata*, Peck, and *A. pometaria*, Harris), were very abundant in the Ottawa district last spring. Only one instance, however, came under my notice of their attacking fruit trees. They were so abundant in the woods that basswoods (*Tilia*), ashes, and maples (*Acer dasycarpum*, Ehrh.) were in some places almost defoliated. In Winnipeg they were very abundant upon the ash-leaved maples grown as shade trees. Through the commendable efforts of Mr. W. G. Fonseca, of that city, some of the residents were induced to spray their trees with Paris green, and as a consequence many trees were saved. The result of this spraying will also show itself in the future.

The NEGUNDO PLANT-LOUSE (*Chaitophorus negundinis*, Thomas).—For several years complaints have been received from Manitoba of an injurious plant-louse upon the ash-leaved maples (*Negundo*), but I always failed to obtain specimens until this year, when a letter was received through Mr. S. A. Bedford from Mr. Thomas Partington, town clerk of the town of Selkirk, Man., as follows:—

"June 9.—I inclose sprig of maple for your inspection. All the maples in the town (and we have hundreds of them planted) are covered with these lice, and we are afraid the trees will be ruined. Will you please advise me what to do. Would spraying with tobacco water do, or smoking smudges made underneath have any effect? Kindly advise us as soon as possible."

At the same time other specimens were received from the same place, from Mr. A. H. Vaughan. Both of the above were advised to use the ordinary Kerosene emulsion. Subsequently I received the following very satisfactory letter:—

"July 10.—*In re* insects on trees, I thank you for your letter and Bulletin 11. We tried the Kerosene emulsion and found it quite effectual. I think 9 parts of water to 1 of emulsion is a little too strong. With 20 gallons of oil and soap and 12 times as much water we have sprinkled and saved many hundreds of large trees."—THOMAS PARTINGTON, *Town Clerk, Selkirk, Man.*

LIVE STOCK.

THE HORN-FLY

(*Hæmatobia serrata*, Rob-Desv.).

On page 144 of my last year's report I referred to a new cattle pest which had appeared in Canada for the first time in the summer of 1892. This was the Cattle Horn-fly, *Hæmatobia serrata*, of which an enlarged representation is given herewith. The perfect insect is shaped much like the Common Cattle-fly or the House-fly, but is smaller and slighter, being only one-sixth of an inch in length, that is, one-third the size of those insects. The colour is dark gray with a yellowish sheen, and the body is covered with short black bristles. The head consists almost entirely of the dark-red silver-edged eyes, but bears on its lower surface the black dagger-shaped tongue which is the cause of so much torture to cattle. When not in use this organ is carried projecting in front of the head. This pest will be at once distinguished from the ordinary Cattle-fly by its smaller size, greater activity and a characteristic habit of gathering in clusters upon the horns of cattle, for which reason it is now generally known as the Horn-fly. It is also for some unaccountable reason often referred to as the "Texas fly." This is only the second year since it first appeared in Canada, but it has increased and spread so quickly, that it has produced great consternation among cattle owners. The frequent assertion that the flies or the maggots have caused the death of cattle by boring into the horns, head or body, is entirely inaccurate: the whole injury is due to the bites of the fly; however, the irritation from this cause is in many cases so great that animals fall off rapidly both in flesh and yield of milk.

Fig. 26.—The Horn-fly. Enlarged.

The life history is briefly as follows:—The mature flies appear early in spring and lay their eggs upon the fresh droppings of cattle. These soon hatch and the maggots live in the dung while it is in a moist condition. They then turn to pupæ in or beneath the dung, and the flies again appear within two or three weeks from the time the eggs were laid. There can thus be several broods in a season.

The enormous increase and rapid spread of this insect throughout the provinces of Ontario and Quebec caused naturally enough, as stated, great consternation among stock owners and dairymen. In many districts the loss was most serious, and I have been informed by cheese-makers that during July in the several districts the amount of milk supplied by their patrons was reduced at least to half the quantity it would have been, but for these pests. A large number of letters were received asking for remedies. The following are selected to show how severe the injuries were, although from what I have been told at farmers' meetings, these do not at all indicate the real extent of the loss in many districts of both Provinces.

"July 18.—Will you kindly send me recipe for the fly pest on cattle? The milk has gone down tremendously in this section during the past week owing to the flies."—Ogden Hinch, *Napanee, Ont.*

"July 30.—The horn-fly is playing the mischief hereabouts and we must take prompt measures to fight the pest and minimize the loss it is entailing. The falling off in milk production within a week has been about 25 per cent, in spite of the fact

that frequent rains have kept the pastures in unusually good condition for the season. The milk delivered at a local creamery has diminished in eight days or so from 21,000 to 15,000 lbs. This you will see is a serious matter."—C. H. PARMELEE, *Waterloo, Que.*

"August 10.—Please send me a horn-fly Bulletin. The flies are very bad and the cows are shrinking and other cattle losing flesh in a frightful way. I have been spraying my cows, etc., for a fortnight with Kerosene emulsion as recommended; but it seems to do but little good. Have you found anything better at Ottawa?"—SYDNEY A. FISHER, *Knowlton, Que.*

So great was the demand for information on this subject from the Province of Quebec that the French edition of Bulletin 14 on the Horn-fly was soon exhausted, and by instruction of the Honourable Minister of Agriculture, I prepared a revised edition which was printed and distributed widely. At the same time I also prepared a single-sheet illustrated circular for publication in newspapers. Copies of this circular were sent to the leading French and English newspapers, together with stereotypes of the above figure, and by that means many who would not otherwise have been reached, obtained the information required to enable them to protect their cattle. The following are the remedies which I have suggested:—

Remedies.—Almost any greasy substance rubbed on the animals will keep the flies away for several days. A number of experiments were tried in the field, with the result that train-oil alone, and train-oil or lard with a little sulphur, oil of tar or carbolic acid, added, will keep the flies away for from five to six days, while with a small proportion of carbolic acid it will have a healing effect upon any sores which may have formed. Axle-grease, tallow, and any such greasy substance can be used to advantage, but train-oil or fish-oil seem to be more lasting in their effects than any others experimented with.

The safest and most convenient way of using carbolic acid is in the shape of carbolized oil which can be prepared by dissolving one ounce of crystallized or liquefied carbolic acid in 1 quart of oil. Train oil, fish oil, tanner's oil, olive oil or any other fixed oil will answer; but not coal oil, as carbolic acid is not soluble in this liquid. The crude carbolic acid does not dissolve easily in fixed oils, and therefore must not be used. Instances have been reported to me of injury to animals, and the hands of operators, when the crude has been substituted for the purer form of carbolic acid.

An effective and undoubtedly the easiest remedy to apply, if a small spray pump be used, is the Kerosene emulsion; which consists of the following:—Kerosene (coal oil), 2 quarts; rain water, 1 quart; common hard soap, 2 oz. Boil the soap in the water till all is dissolved; then while boiling hot, turn it into the coal oil, and churn it constantly and forcibly with a syringe or force pump for five minutes, when it will be of a smooth creamy nature. If the emulsion be perfect, it will adhere to the surface of glass without oiliness. As it cools it thickens into a jelly-like mass. This gives the stock emulsion, which must be diluted before using with nine times its measure (that is, twenty-seven quarts) of water. It will be found to mix much more easily if done at once, before it cools. The above proportions give three quarts of the stock emulsion, which with twenty-seven quarts of water added make up thirty quarts of the mixture ready for use. This may be applied to the animals by means of a sponge, brush, rag, or, what will certainly be found most convenient where there are many animals to treat, by means of a force pump and spray nozzle. The emulsion thus made and sprayed over the cattle kills all the flies it reaches, and if repeated twice a week will almost entirely relieve cattle from annoyance. Another method of diluting the coal oil is to make the emulsion with milk instead of soap and water. Take sour milk, one part; coal oil, two parts. Mix the two thoroughly, as described above for the soap emulsion. Then dilute with water, so that one part in ten will be coal oil.

Prof. H. A. Morgan, of the Louisiana Experiment Station, has tried some experiments during the past year with various materials, the results of which he summarizes as follows:—"It was soon found that none of the solutions were of much value except Kerosene and Fish-oil emulsions, and after a third trial, all were discarded except these. At this time the Fish-oil emulsions had shown superiority

over the Kerosene, and further trials soon showed that animals after four or five days from time of spraying with Fish-oil emulsion were free from attack of flies, while those upon which Kerosene emulsion had been used were more or less annoyed." (*Louisiana Exp. Station Bull., 2nd series, No. 22.*) Fish-oil emulsion differs from Kerosene emulsion only in the substitution of fish-oil for coal oil or kerosene.

A good way to fight this pest will doubtless be to prevent it from breeding and increasing. As stated above, the maggots can live only in the moist droppings of cattle. Any means, therefore, which will insure the drying up of these before the maggots are full grown, will destroy them. This can be done most easily by spreading the dung out in the pastures regularly and at short intervals. Twice a week would be sufficient, and it would be equally effective in wet weather when the substance would be washed away, as in hot weather when it would be dried up.

Where the flies gather in large numbers, on the ceilings and walls of stables in cool weather, or when driven from the cattle by applications, they can be destroyed by spraying them with either Kerosene emulsion or a strong decoction of Pyrethrum Insect Powder. Dusting them with dry Pyrethrum powder by means of an "insect gun" would also be effective.

In studying the history of this insect since it first appeared in North America in 1887, I have noticed that at the places where some years ago its attacks were very severe, it is now much less troublesome. I was, therefore, led to hope that after a time, the considerable loss which Canadians are now suffering from the Horn-fly, would be much less. Correspondence with entomologists confirmed this view. In reply to letters, on this point and with regard to any new remedies which might have been discovered, addressed to the United States Entomologist, and other specialists who have studied this pest, I have received the following:—

"Yours of 25th has been received during Prof. Riley's absence. We have found nothing better than Kerosene emulsion for the protection of cattle from the Horn-fly. In answer to your second question, I may say that it has been almost the invariable rule that the second year the flies are worst, and after this bad second year the numbers are fewer. We have explained this on the ground that native parasites preying ordinarily on native dipterous larvæ in cow-dung acquire a taste for the Horn-fly larvæ after a short time."—L. O. HOWARD, *Acting Entomologist, Washington, D.C.*

"Concerning the Horn-fly, I have nothing new in the way of remedies. As I have stated on several occasions, the insect is not now troublesome in our State, and there is no necessity for applications of any kind to cattle. Our farmers found fish-oil with a little carbolic acid to be much the most satisfactory material that could be used, and I never could induce any to try the Kerosene emulsion. *A propos* of this, at the Madison meeting of the Association of Economic Entomologists, in the course of a discussion, almost all those who had been advocating the use of Kerosene emulsion on live stock, stated that they did not further recommend it, because of the difficulty of getting farmers to make it properly, and of the danger where it is not properly made."—PROF. JOHN B. SMITH, *New Jersey Agric. Coll. Exp. Station.*

Prof. W. B. Alwood, of West Virginia, has found that the stock emulsion diluted ten times and mixed with one part of water extract of tobacco waste (made by steeping 1 pound of tobacco stems in 1 gallon of hot water for an hour or more), gave almost perfect immunity for a period of three days, and that two treatments per week almost entirely relieved his cattle from annoyance. He makes the application with a knapsack pump fitted with a cyclone nozzle, and the work is done just after milking time. His method is as follows:—The animals are driven into an inclosure through a gate which will only admit one at a time. A man with a knapsack pump on his back stands at the gate and sprays one side of each animal as it passes; they are then driven out again, and the other side is treated in the same manner. The quantity of liquid thus applied is very small, but has been found sufficient.

Prof. Alwood writes recently:—"Concerning treatment of Horn-fly I am proceeding still just as given in my note at Washington meeting. (*See above*). Of

course details vary with conditions and surroundings. The Horn-fly has given no trouble to speak of, this season. It began its depredations here in 1889, was bad in 1890 and 1891, less so last year, and was scarcely noticed this year after July."

With reference to the remedies above given I must mention that I have had complaints from two or three, that the Kerosene emulsion did not protect the cattle for a sufficient time to make it worth while to apply it. I, therefore, have experimented to find something more effective. The results of these experiments were that, when the flies are at their worst, it is necessary to spray cattle with the ordinary Kerosene emulsion every two days. Tanner's oil containing some carbolized oil, or oil of tar, is more lasting in its effects, but takes longer to apply and requires much greater labour.

DIVISION OF BOTANY.

A large number of additions have been made during the year to the collection of shrubs and trees in the Arboretum; many species of the following genera were allotted places in their own groups in the Botanical garden, viz., the Ashes (*Fraxinus*), the Lilacs (*Syringa*), the Elms (*Ulmus*), the Meadow Sweets (*Spiræa*), the Withe bushes (*Viburnum*), the Poplars and Willows (*Salicaceæ*), and in addition to these, several specimens were added to other orders of plants. Many plants were set out in the border for perennials, and the seeds of others were sown for future transplantation.

At present the collection of trees and shrubs in the Arboretum consists of 600 different species and varieties, all of which are arranged to show the individual species to the greatest advantage and grouped in families. There are in nearly all cases two specimens of each kind.

Notes have been taken as to the comparative beauty of the different varieties of flowering shrubs, their hardiness at Ottawa and the dates at which they flower. Herbarium specimens have also been taken to show to any one wishing to know the appearance of the best and hardiest shrubs and ornamental trees before purchasing. The following is a list of the orders represented in the Arboretum, with the numbers of species in each order:—

Anacardiaceæ	9	Magnoliaceæ	1
Anonaceæ	1	Moraceæ	5
Araliaceæ	1	Myricaceæ	3
Berberidaceæ	12	Oleaceæ	60
Betulaceæ	13	Platanaceæ	2
Bignoniaceæ	5	Rhamnaceæ	6
Caprifoliaceæ	51	Rosaceæ	64
Celastraceæ	9	Rutaceæ	2
Compositæ	1	Salicaceæ	56
Coniferæ	83	Sapindaceæ	34
Cornaceæ	18	Saxifragaceæ	27
Cupuliferæ	47	Simarubaceæ	1
Ebenaceæ	1	Solanaceæ	1
Elæagnaceæ	12	Ternstrœmiaceæ	1
Ericaceæ	1	Thymelaceæ	1
Hamamelaceæ	2	Tiliaceæ	8
Juglandaceæ	9	Urticaceæ	27
Lauraceæ	2	Verbenaceæ	1
Leguminosæ	23		

AWNLESS BROME, AUSTRIAN BROME

(*Bromus inermis*, Leyss).

This grass which has sprung rapidly into favour with most who have tried it, has now been under cultivation at Ottawa for 6 years. It has been reported upon favourably two or three times (*C. E. F. Annual Report*, 1890, p. 185; 1891, p. 213; *C. E. F. Bulletin* 19, p. 10.) and all reports which are now being received, particularly from the North-west Territories, are almost universally in praise of it. In order to get it known as soon as possible in those districts where such a grass was urgently needed, samples were distributed to farmers in all parts of Canada in rather larger packets than those which were included in the collections of desirable grasses sent out for testing. From such reports as are to hand, I am therefore able to speak more confidently of the value of this grass than if the opinion were formed only upon my experience with it here at Ottawa.

Fig. 27.—Awnless Brome Grass.

It is a perennial with a running rootstock. It is conspicuous for its free leafy growth and tall stems which bear an abundance of good seed. It has proved itself to be very hardy, earlier than most of the grasses in cultivation, and a heavy cropper. It flowers at Ottawa in the last week of June. On good rich moist soil it has produced over $3\frac{1}{2}$ tons of hay to the acre, and later a heavy aftermath of succulent leafy shoots. It has great power to withstand drought, as has been observed by my western correspondents. Prof. S. M. Tracy, Director of the Mississippi Experiment station and one of the leading specialists of economic grasses in the United States, says of it: "This is nearly related to the well-known 'rescue grass,' but is decidedly superior in its more permanent character and ability to thrive on drier and less fertile soil. It starts into growth with the autumn rains, and is fresh and green during the winter months, being uninjured by our heaviest frosts." (This is in Mississippi, but it is equally true in Canada.—*J. F.*) "It forms a compact sod so firm as to prevent the growth of other grasses and weeds, and the yield of forage is larger than from any other winter grass we have tested. It is eaten well by all kinds of stock." (*U. S. Dept. of Ag. Rep.*, 1892, p. 209.)

On the whole we consider this one of the most valuable of the introduced grasses, both from its feeding qualities as evinced by the following analysis made by Mr. Shutt, in which it is shown to be rich in albuminoids and at the same time low in fibre, and also for its free luxuriant habit of growth, its earliness, heavy aftermath and hardy nature. The seed is light and should be sown by hand when there is a slight breeze. It may be sown from 28 to 35 lbs. to the acre. The seed weighs 14 lbs. to the bushel.

Analysis of Awnless Brome.	Green Plants.	Water-free Substance.
Water	63·02	0·
Ash	3·12	8·45
Protein (albuminoids)	4·99	13·50
Fibre	11·18	30·24
Carbohydrates	17·27	46·65
Fat	0·42	1·16
	100·00	100·00

GRASS FOR THE PROTECTION OF SHORES AND HARBOURS.

Inquiries are frequently made for the seeds of grasses to be grown as binders of shores and sand banks. During July last, information was sought on this subject by Mr. E. T. P. Shewen, resident engineer of the Department of Public Works at St. John, N.B., Mr. Shewen writes:—

"August 30.—My object in using the grass is to stop the dry drift of sand which is now filling a harbour. The beach I wish to protect at Cape Traverse is flooded in gales."

At the time I received the above letter I had neither seed nor plants of the true Beach grass, *Ammophila arundinacea*, Host., (=*Calamagrostis arenaria*, Roth, =*Psamma arenaria*, R. & Sch.), nor could I, although it is a native of Canada, obtain any from seedsmen or others. In 1890 I received from Mr. John Mather of Ottawa, seeds of that grass and the closely similar *Elymus arenarius*, L., both imported from Scotland by him for the very purpose desired by Mr. Shewen. Of all the seed sown of both species, only two plants of *Elymus arenarius*, Sea Lyme grass, grew, and these have increased and spread enormously since they were first put out in 1891. These two grasses are extremely alike in appearance and habit of growth, in fact in everything except their inflorescence. I therefore sent Mr. Shewen in September about 100 sets of this grass and some of the seed. Some time in October I had the pleasure of showing Mr. Artemas Howatt of Tryon, Prince Edward Island, over the grass beds and was explaining the uses of the Sea Lyme grass to him, when he told me he was sure it, or a similar grass, grew on the shores of Prince Edward Island. It at once occurred to me that the grass he spoke of might be the Beach grass I had been trying to get. He kindly sent me, on his return home, a good supply of the roots and some of the seeds from which I saw it was the true Beach grass.

I at once wrote to Mr. Shewen, and he has corresponded with Mr. Howatt with a view to getting a supply of the grass roots.

These two grasses mentioned are probably the best varieties for growing for the purpose named, on the sea shore, where the disturbance is sometimes very great. Indeed this disturbance seems to be a necessary factor towards their full development. They will however flourish inland and at localities where they are in no way affected by the sea or its influences, as I have found at Ottawa. On lake and river shores the different forms of *Agropyrum repens*, L., (Quack, Couch, Scutch, etc.) may be grown, or the Holy grass (also called "Indian Hay" and "Vanilla Grass," *Hierochloa borealis*, R. & S.). A trial might also be made with the new fodder grass, *Bromus inermis*, Leyss, (Awnless or Austrian Brome grass). When it can be obtained, however, it is probable that the true Beach grass (*Ammophila arundinacea*) is the best of all for protecting harbours, and after that the Sand Lyme Grass (*Elymus arenarius*).

The following extract from Sowerby's *English Botany*, will show the great value of this grass for the purpose recommended: "This grass is known as Mat grass or Murram. Dr. Prior says, the latter name is derived from the Gaelic *muram* or the Danish *marhalm*, sea haulm or straw. Its value as a natural sand-binder cannot be overrated; many thousand acres, on various parts of our coast, are preserved from being overwhelmed by the drifting sand by means of its agency. In the latter part of the last century a large district on the eastern side of Scotland, near the Moray Firth, was completely destroyed and rendered in a few years as desert as the Sahara by the advance of the sand from the shore, owing to the wanton destruction of the Murram that grew upon it. This grass, therefore, when found growing on sandy shores, should always be carefully preserved by proprietors of land. Acts of Parliament have been passed to protect it, which are but little attended to; and in Holland it is said that its destruction is a penal offence. The strong underground stems, which render it so valuable as a protection against the action of the wind and waves, are capable of being made into ropes; and people near the coast often plait them into mats, whence one of the common names of the grass. Professor Buckman says: 'We have exhumed rhizomata of this grass several feet

in length, and as these mat and weave together, in the position indicated, they act as powerful conservators of the coast-line, and we cannot help thinking that the *Psamma* might be cultivated with advantage with the view of keeping together some of our slippery railway embankments. To this it may be objected that it is a maritime species; but inasmuch as we have grown it on the sandy clays of the Forest Marble, far remote from the seaside, we have no fear of its success on this account.' "

The following is extracted from "*Grasses and Forage Plants*" by Charles L. Flint (Boston, 1887), and shows what an important role the plant has played in the history of a part of the American coast: "This grass is very generally diffused on sea coasts over the world and is found inland on the shores of Lake Superior. It has also been cultivated by way of experiment and with success on the sands at Lowell, Massachusetts, and still further up on the banks of the Merrimack River. Though not cultivated for agricultural purposes, it is of great value in protecting sandy beaches. It is preserved in England and Scotland by act of Parliament. It flowers in August.

"As it is of national importance in protecting our sandy coasts, some account of its culture may not be inappropriate or uninteresting. The town of Provincetown, once called Cape Cod, where the Pilgrims first landed, and its harbour, still called the Harbour of Cape Cod,—one of the best and most important in the United States, sufficient in depth for ships of the largest size, and in extent sufficient to anchor three thousand vessels at once,—owe their preservation to this grass. To an inhabitant of an inland country it is difficult to conceive the extent and the violence with which the sands at the extremity of Cape Cod are thrown up from the depths of the sea, and left on the beach in thousands of tons, by every driving storm. These sand-hills, when dried by the sun, are hurled by the winds into the harbour and upon the town. A correspondent at Provincetown says: 'Beach grass is said to have been cultivated here as early as 1812. Before that time, when the sand drifted down upon the dwelling-houses, as it did whenever the beach was broken, to save them from burial, the only resort was to wheeling it off with barrows. Thus tons were removed every year from places that are now (owing to the cultivation of this grass) perfectly secure from the drifting of sand. Indeed, were it not for the window glass in some of the oldest houses in these localities, you would be ready to deny this statement; but the sand has been blown with such force and so long against this glass as to make it *perfectly ground*. I know of some windows through which you cannot see an object, except to remind you of that passage where men were seen 'as trees walking.' "

"The mode of culture is very simple. The grass is pulled up by hand and placed in a hole about a foot deep, the sand is then pressed down upon it. These holes are dug about one foot and a half apart. The spring is the usual time of planting, though many do this work in the fall or winter. The roots of the grass, from which it soon covers the ground, are very long; I have noticed them ten feet, and I suppose upon high hills they extend down into wet sand.

"Congress appropriated, between the years 1826 and 1839, about $28,000, which were expended in setting out Beach grass near the village of Provincetown, for the protection of the harbour. From the seed of that grass it is estimated that nearly as much ground more has become planted with it, as was covered by the national government. In 1854 five thousand dollars were wisely expended by the general government in adding to the work; and the experience of former years was of great value to the efficiency of this latter effort."

The Beach grass and Sand Lyme grass are harsh coarse grasses with tough pale grayish leaves and spread by long underground root stocks. The leaves are tipped with a sharp hard spike which is capable of piercing the skin. The chief difference between these two grasses is a botanical one, viz., in the arrangement of the flowers; for practical purposes they are so much alike that, if the true Beach grass cannot be obtained, the Sand Lyme grass may be used, but it has not apparently power to spread quite as rapidly.

As to the fodder value of these grasses, we have made no experiments; but the following extracts bear on this point:—

" *Psamma arenaria.*—This grass seems to be indestructible by drift sand, and authorities differ as to whether it is eaten by stock; but the park ranger at Port Fairy says they eat it ravenously in winter and thrive well upon it." (*Report of Agric. Bureau of South Australia for* 1892, p. 12.)

" *Elymus arenarius.*—Sinclair calls this grass the sugar-cane of Great Britain. It contains a large quantity of saccharine matter, and it is probable that, mixed with beach grass, as it is in Holland, it would be valuable to cut up and mix with common hay for winter feed." (*C. L. Flint. Grasses and Forage Plants*, p. 120.)

TUMBLE WEEDS.

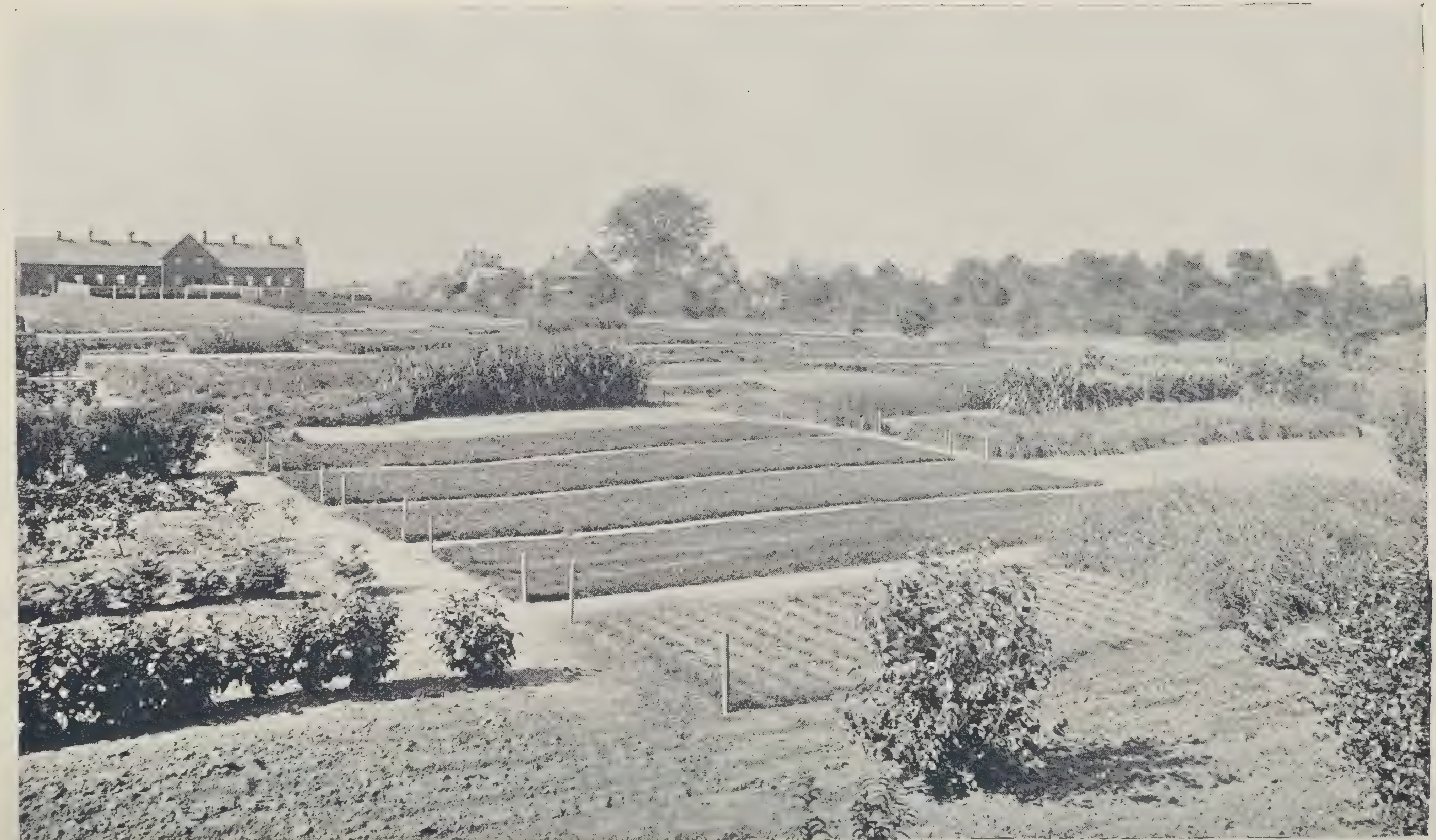
Tumble Mustard (*Sisymbrium sinapistrum*, Crantz).

This new pest in the North-west Territories is still very abundant about Indian Head, notwithstanding the efforts which have been made by Mr. Mackay and others to eradicate it. Mr. Mackay writes from Indian Head under date Nov. 14:—"We were almost buried yesterday with a neighbour's tumble weed. A hurricane blew all day from the North-west, and the edge of a field adjoining the farm is now 10 feet deep with this weed. The trees are full and fences cannot be seen for bank of weeds. The result of yesterday's blow will be to give us many extra days' work next summer, for millions of seeds have been left on the farm. Looking between here and the town while the weeds were galloping along, the prairie seemed like the ocean with a big storm blowing." It is needless to say that every effort should be put forth now to eradicate this annual weed, as it is evidently one of the very worst pests which has ever been introduced into the country. The name "Tumble Mustard," proposed by Prof. W. M. Hays of the Minnesota Agricultural Experiment station, is, I think, particularly appropriate for this pest, for, as he says, "it draws attention to the important fact that the weed combines the spreading power of a 'tumbler' with the longevity of seeds of a mustard." The weed which more than any other has always been known as Tumble weed in the west is *Amarantus albus*, L.

The Russian Thistle, Russian Tumble Weed (*Salsola Kali*, L., var. *Tragus*, DC.)

This plant which has attracted so much attention in the United States, has not yet been found in Canada; but it is well to warn our farmers to take every precaution against its introduction. The United States Government has issued a timely bulletin by Mr. L. H. Dewey, Assistant Botanist of the United States Department of Agriculture, illustrated by figures of the plant in different stages, and of the seed enlarged. The *Farmer's Advocate*, of London, Ont., has wisely published a warning article to Canadian farmers, giving quotations of the above, and reproductions of the figures. The publishers have kindly lent me the figures used in that article for this notice.

These will serve to draw attention to the plant and show those who have not seen the above articles, what its appearance is. It is not a true thistle, but is a variety of the European Salt-wort, and is related to the lamb's quarters and spinach. It takes its name "thistle" from the fact that, as the seeds ripen, the stems develop at each joint instead of leaves three sharp spines. The spines are described as harder than, and as sharp as, those of the Canada thistle, so that farmers have to wrap leather round their horses' legs when cutting grain infested by it. It is an annual, and has been introduced for fifteen years. It has now spread over an area of 30,000 square miles, and is abundant and troublesome over two-thirds of that area. Mr. Dewey says in his bulletin: "In the badly infested areas more than 940,000 acres are devoted to wheat raising. The average loss on this land, which may be attributed to the Russian Thistle alone cannot be



GRASS-BEDS—CENTRAL EXPERIMENTAL FARM, OTTAWA.

less than five bushels per acre; and 3,200,000 bushels at the minimum price of 50 cents per bushel (which is considerably less than the average price) indicates a loss to the farmers in the two Dakotas of $1,600,000. The loss in other crops, the injuries caused by the spines, and the fires caused by the plants jumping fire-breaks, will bring the total loss to something more than $2,000,000 for the year 1892.

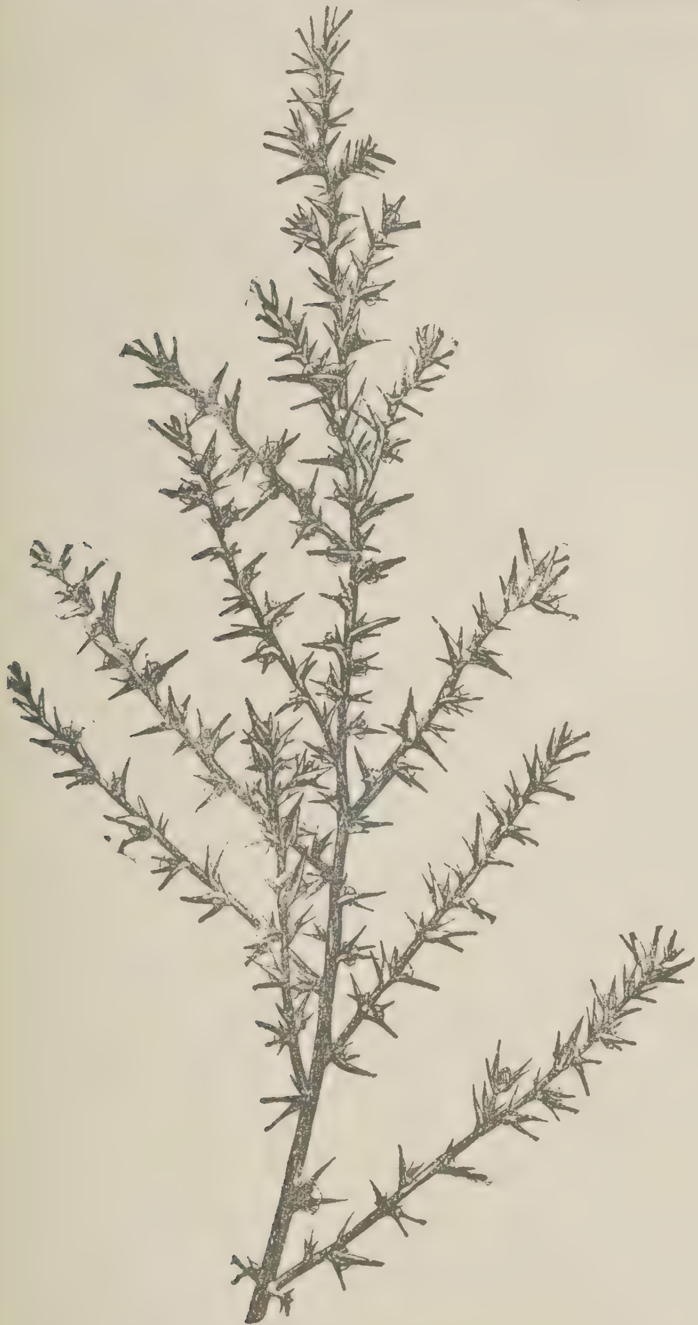


Fig. 28.

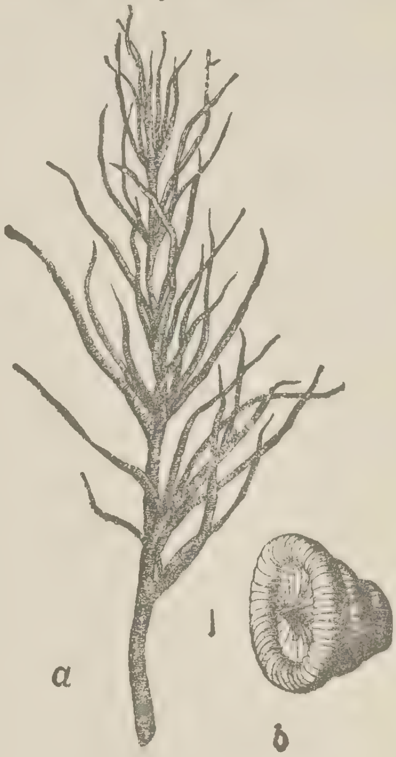


Fig. 29.

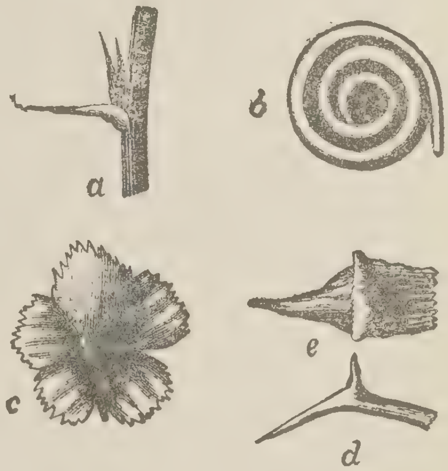


Fig. 30.

RUSSIAN TUMBLE WEED.

Fig. 28.—A branch of a mature plant. Fig. 29.—A young stem showing the nature of the leaves before the flowering period and a single seed enlarged. Fig. 30.—Enlarged details of the prickles, the flower and the seed from which the seed coat has been removed.

"These figures may seem alarming, but they are based on conservative estimates. If they are alarming to the farmers, it is well, for it is only when alarmed that most men will take effective measures to avoid danger."

I have been on the lookout for this weed through my correspondents for the last two years, and my attention was officially directed to it during the past summer by the Immigration Branch of the Department of the Interior. I am glad to be able to report that so far it has not been detected in the Dominion.

REPORT OF THE POULTRY MANAGER.

(A. G. Gilbert.)

To William Saunders, Esq.,
Director Dominion Experimental Farms,
Ottawa.

Sir,—I beg to submit the sixth annual report of the Poultry Department. During the winter of 1891–92 careful watch was taken of the laying stock in order to discover, if possible, the cause of and remedy for egg and feather eating, the two vices fowls in close confinement are most addicted to. The subject is one of the greatest importance, necessitating the closest attention in order that correct conclusions may be arrived at. If the fowls eat their eggs, it is apparent that the whole means of money making is gone from the poultryman, until the practice ceases. Observation was continued last winter and to the notes already made and published the following may be added:—

1. That the vicious practices are most indulged in during the months of February and March.
2. That, unless at once checked on first showing, they continue until the fowls are allowed outside.
3. That the non-layers do not indulge in the vices until the others commence.
4. That the inactivity of the layers, caused by overfeeding, leads to the vices.
5. That the breeds of the more nervous temperaments viz., Black Minorcas, Andalusians, Red Caps, &c. &c., are most addicted to the practices.
6. That the vices first show among the fowls in the greatest number in one pen.
7. That egg eating began where the laying nests were most exposed to view of the fowls.

CONCLUSIONS ARRIVED AT.

It must be understood that the fowls were closely confined to their pens from the time winter prevented their running outside, until the snow disappeared in early spring. The conclusions to be arrived at from the foregoing are:

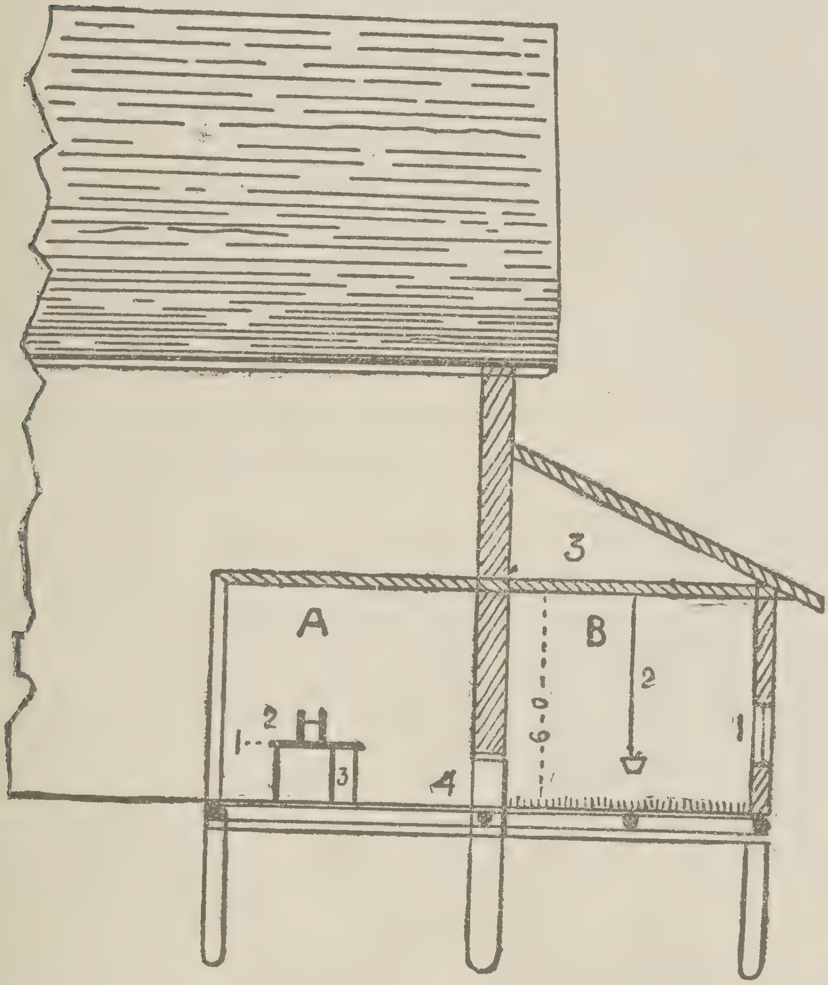
1. It is imperative that the layers be kept in constant activity.
2. That they must have plenty of room to scratch in.
3. That the pullets are better separated (when possible) from the older fowls.
4. That plenty of green stuff should be fed in the shape of clover hay, cabbage, mangels, turnips, &c.
5. That green bones, cut up and fed regularly, are the best preventives.
6. That the laying stock should have access to barn, shed or stable to scratch in, whenever circumstances permit.
7. That the nest boxes *must* be so arranged that they will be dark and not too easy to get to.
8. The more limited the quarters, the greater the necessity of exercise.
9. The more natural the conditions under which the layers are kept, during the close season, the better for them, the more profitable the result.

In the portions of the Dominion where the winters are comparatively mild the care and treatment of the stock are attended by a *minimum* amount of labour and anxiety. In such localities opportunities to let the layers out for a run frequently occur and the vices mentioned above are not experienced. On the other hand there are portions of the country where necessity compels the housing and the artificial treatment of the layers during certain months. As remarked in report of 1891, it is to persons so situated that the experiments relating to the care and management of fowls in winter quarters will be most valuable.

A FEW PLANS FOR THE FARMER.—HOW RANGE AND SCRATCHING ROOM MAY BE SECURED.

The farmer with one breed, or his ordinary barn yard fowls will have little difficulty or expense in arranging a house so that while it gives some warmth to the layers at night, which is very desirable, will also afford room for them to range, scratch and dust in during the day, and so prevent the vices aforementioned. It is with the object of giving some help in this direction that the following plans are submitted:

Diagram No. 1.



A.—1. Platform.
2. Support for roost with notch.
3. Entrance to nests under platform.
4. Slide door to scratching house.

B.—1. Window facing south.
2. String with cabbage attached.
3. Space for straw, sand, gravel, &c., to be let down below.

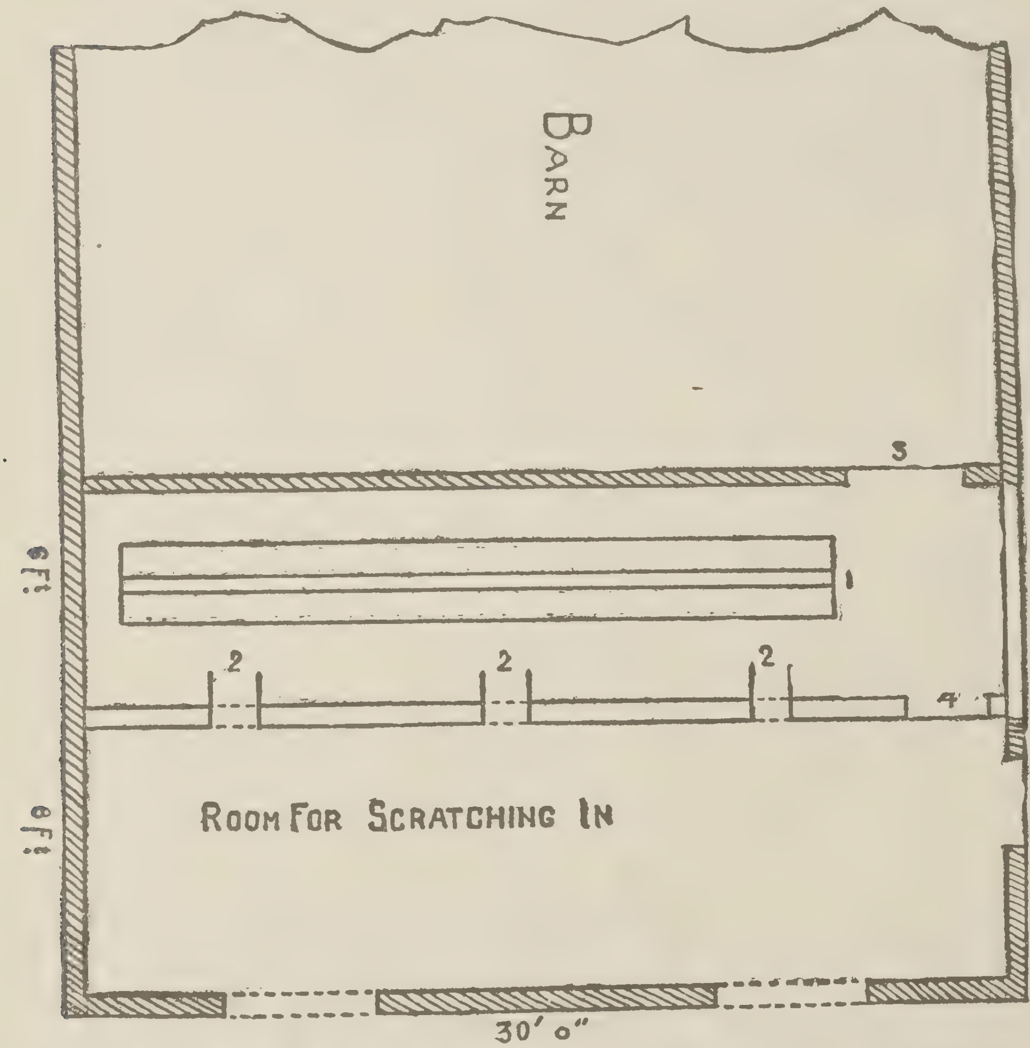
The above plan No. 1 represents a house and addition that can be added to the end or side of a barn facing south. A small portion "A" of the end of the barn is partitioned off for the roosting and laying room. The ceiling is made low, and under this low ceiling is the platform and roost so placed as to economise the animal heat of the fowls during the cold night, and keep them as comfortable as possible during that period. The roost should be a 2 x 4 inch scantling, broadside down, and placed 10 or 12 inches over a platform which should be two and a half feet wide and eighteen inches from the ground. Under this platform should be the nests so arranged that by boarding the front of the platform, they (the nests) will be kept dark. The partitions of the nests will support the platform. The object of keeping the nests dark is to offer no inducement to the hens to stay in, or about them after the egg is laid, and to keep the other hens from seeing the eggs. Egg eating is so prevented and prevention is a great deal easier than the cure. After keeping themselves comparatively warm by scratching busily all day in the scratching room the layers require some warmth during the night and in most poultry houses that is the very time they are coldest.

"B." This is an addition that can cheaply be made to the barn and should be to the south. A slide admits the fowls from A to B. On the floor of this scratching

house B is $2\frac{1}{2}$ feet of dry sand, fine gravel, fine coal cinders, ashes, lime and grit in the shape of ground oyster shells, broken mortar or plaster, pieces of old crockery broken up, and any other substances calculated to make the conditions as like those of the outside run, of the open season, as possible. The floor may be of boards or earth but it must be kept perfectly dry. A narrow trough 2 or $2\frac{1}{2}$ inches wide should be attached to the wall so as to permit of the proper feeding of soft food, if given. The object of this scratching house is to keep the layers busy all day and as much as possible out of house A, where they are only wanted to go to roost in and to lay. A fair sized window or windows should be in the south wall so as to admit as much sunlight as possible.

The houses can be made as large or as small as the number of hens require, always allowing 4 feet square for each hen, at the least, in the scratching room, and 8 to 10 inches roosting room for hens of medium and small size.

Diagram No. 2.



1. Platform and roosts with nests underneath.
2. Slides to scratching room.
3, 4 and 5. Doors.

The above plan, No. 2, shows the end of the barn with the roosting and laying room and scratching room attached.

The numbers are explained as follows:—

1. Is the platform and roost with the nest boxes underneath. This platform need not run all the length of the room. Indeed, the room might be made smaller and warmer at night by making the platform into smaller lengths and running them cross-ways or from north to south.
2. Are the slides to allow access to scratching-room. In a smaller house one or two might do.

3 and 4. Are doors to get into the apartments.

5. Is a side door to get in and out of the room for scratching, to clean up, etc. If it can be managed without, there need be no necessity for this door, as the fewer openings the less cold the premises are likely to be.

Diagram No. 3.

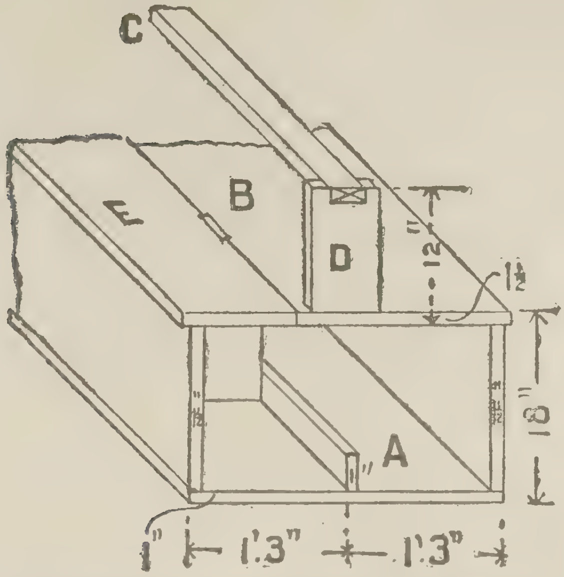


DIAGRAM SHEWING PERCH AND NEST BOXES UNDER

The above diagram shows the darkened nests. A is the passage way to the nests under the platform B. The 2 x 4 inch scantling roost is shown by C. D shows the piece of wood with notch to support the roost. E is a portion of the platform hinged so as to lift up (as shown in diagram 4) to permit access to the nests.

Diagram No. 4.

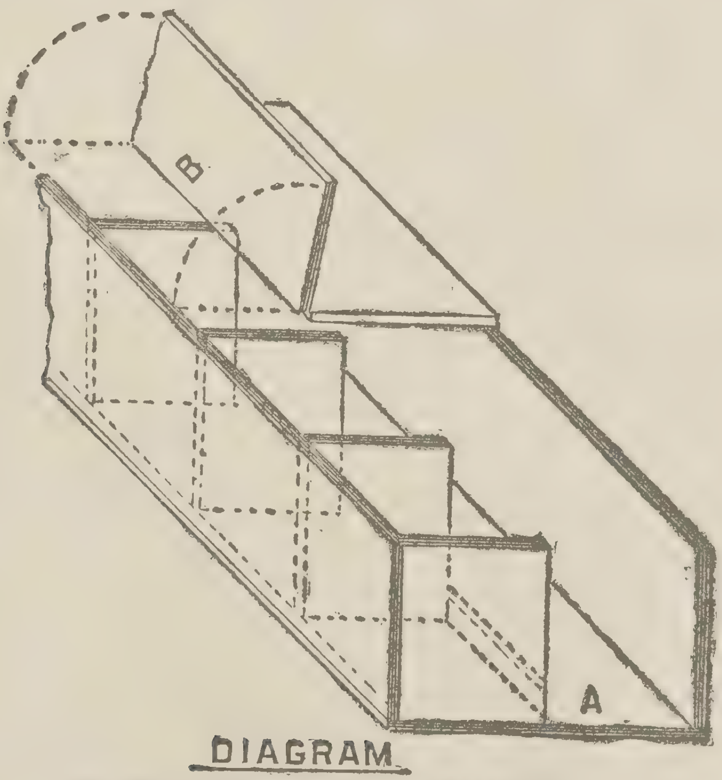


DIAGRAM SHEWING NEST BOXES

The above diagram shows the arrangement of the nests under the platform, the passage way A and the hinged board B. The hinged board lifts up so as to allow access to the nest boxes.

THE RESULTS HOPED TO BE ATTAINED.

The results hoped for in having the houses constructed as outlined, briefly summarized are:—

1. By a southern exposure to secure as much sunlight and warmth as possible.
2. The sunlight being a great incentive to scratching, dusting in the earth, etc.
3. To prevent by constant exercise any opportunity to indulge in feather eating.
4. By having the nests dark and secluded, to prevent egg eating.
5. By the comparatively low ceiling to keep the layers as comfortable as possible during the night, by economizing the heat of their bodies.
6. By the liberal quantity of sand, fine gravel, grit, &c., &c., placed on the floor of scratching-room, or shed, to make the conditions as natural as possible and so afford every inducement to constant activity.

THE PROPER TREATMENT OF THE LAYING STOCK IN ABOVE QUARTERS AN IMPORTANT CONDITION.

Before going on with the consideration of this subject, it must be insisted that the laying stock be under two years of age, and that they should never be allowed to exceed that age. The winter quarters may be according to the most approved designs; the treatment the very best known, and yet eggs will be few in number if the hens are over the age mentioned. It has been remarked, in previous reports, that in the case of Leghorns, Minorcas or Andalusians another year may be permitted, but except in the case of experts, it is best to be on the safe side. And in the case of selecting breeders from the best layers, it may be necessary to keep a hen two and a half or three years of age, but at present we are strictly speaking of how best to secure eggs in paying quantities. It is like going over old ground to repeat the instructions so fully given in 1889 report as to the treatment of the laying stock, but as the conditions as to housing, &c., &c., in the present case are somewhat different, it may be admissible so to do.

THE EARLY RATION.

The first essential to success is proper feeding. If a mash is prepared for the morning ration only enough to satisfy should be fed. On page 107 of 1889 report, the following rule is laid down *re* the early morning ration: "Feed only enough soft food to *barely satisfy*, never so much *as to gorge*. When a hen has had so much food that she will go into a corner and mope, she has had too much and if the overfeeding is continued, will soon cease to lay." The rule is *emphasized* on the present occasion. Where opportunity permits the cutting, or breaking up (not grinding) of green bones they might be given for the morning ration and nothing else. There is really no rule as to the quantity of green bones to feed, so much depends upon the breed, but one pound to 15 or 20 hens, may be mentioned as a guide. If the hens are exercising well and laying freely, and the latter generally follows the former, a small quantity of grain may be fed at noon, but it must be so scattered in the straw, or buried in the sand, that the hens will have to search for every grain of it. A plan that has been found successful is the suspension of a cabbage by a string from the ceiling, about three feet from the ground, so that the hens will have to jump to get at it. Substituting a piece of tough meat, raw, or partially cooked, will be found to answer well. Experience has proved that green stuff in the shape of any of the dry clovers steamed and mixed in the morning mash, or exposed by itself, is much relished by fowls. When mixed in the mash it should be cut up into inch pieces. Vegetables of some kind must be kept before the layers at all times. It is astonishing the quantity of grass, fowls and chickens eat, when at large, and if we are to make the conditions of their artificial treatment as natural as possible, green food must be liberally supplied. It is not necessary to

use every kind of vegetable in rotation, but vegetables of one kind or another, are as a rule, abundant on a farm and the inferior or unmarketable specimens may be given to the poultry. Small potatoes boiled and mixed with wheat bran to which may be added the table and kitchen waste and a couple of handsfull of coarse sand or ground mortar, the whole fed warm for the morning ration, will be found an excellent variation.

LIGHT FEEDING OR NONE, AT NOON.

Where meat, bones, and vegetables are furnished liberally and regularly there will be no necessity for a noon ration. It must be borne in mind that the tendency is rather to overfeed than otherwise where poultry are cared for, and on the other hand where poultry are not looked after, they get neither care nor comfortable quarters, and of course there is little likelikood of results of any kind being obtained.

THE AFTERNOON RATION.

The evening or rather early afternoon ration, for winter days are short, should be a generous one. It is well to remember that a long night fast is before the layers and it is proper to have them go to roost with a full crop. It is better to feed whole grain for this afternoon ration. Should cut, or broken up green bones, not have been fed in the morning it might be well to give a half ration of them at noon and the remaining half at the afternoon grain ration, reducing the grain in proportion to the quantity of bone fed. Neither bones, nor mash, should be fed in anything or anywhere, but in the clean narrow trough at the side of the scratching room. Mr. Alexander Stewart, the well known market gardener and farmer of Hintonburg, told me that he always found his Plymouth Rock hens to lay well in winter on oats and plenty of cabbage. His poultry house was not a particularly warm one.

KEEP THE WATER FROM FREEZING IF POSSIBLE.

It would be a very great gain if the shed or house for scratching in, could be so constructed or situated, as to prevent the freezing of the drink water. And where the water does freeze care should be taken to have the chill taken off before it is given to the layers. It should be supplied in this luke warm condition at least three times a day. Laying hens drink a large quantity of water. But a cold house has other disadvantages such as the vegetables freezing solid; droppings freezing hard to platform and the floor becoming very cold. It has been before remarked that when the layers are kept in a very cold house, the food instead of going to make eggs is drawn upon to supply animal heat. And yet artificial heat is not desirable when it can possibly be done without. If the house could be kept at the freezing point, or three or four degrees higher, it would be found suitable. Before going further it may be as well to summarize the information so far given as to the exercising and feeding of the layers. In that shape the points may be easier to remember.

SUMMARY OF EXERCISE AND FEEDING POINTS.

1. Do not gorge the layers by overfeeding.
2. Use every incentive to keep them from idleness.
3. Feed as much cut or broken green bones as possible.
4. Less grain is to be fed when bones and vegetables are supplied in abundance.
5. The evening ration should be a grain one and generously fed.
6. The object being to keep the crops of the layers full during the long night fast.

7. The soft food and cut bones should be fed in a clean narrow trough.
8. When necessary take the chill off the drink water and supply regularly.
9. Keep only young, active, prolific layers, and select from them to breed from.
10. Kill the non-layers for they are only eating away the profit margin.
11. Keep no male bird with the laying fowls. They do better without him.
12. Keep a sharp watch on the layers and anticipate every want.

THERE MUST BE NO COMPLAINT ABOUT TROUBLE.

"Oh! all this entails a great deal of trouble" may be remarked. Of course it does, but is it as much, or any more, than that experienced by the successful dairy farmer; the market gardener; the cattle breeder, or that peculiar to any other department of the farm?

"And it requires a lot of study to learn the proper management of poultry," is the next objection heard. And so it does, but when that knowledge is acquired there is no department of the farm that will pay a larger percentage of return for the time invested. The great drawback to the poultry department heretofore has been that no systematic or intelligent efforts have been made to develop its true value. Eggs have been put on the market when the warm spring weather made everybody's hens to lay and prices were, in consequence, at the very lowest. During the winter the fowls were non-productive and their keep was likely a loss to the farmer. And they were so kept because the farmer did not care to make them remunerative. Taken even at the lowest, the egg and poultry trade of Canada and the United States represent enormous figures. But the object is not to discuss the poultry interests at this time, but to glance at the inducements held out in different parts of the country to the farmer to produce eggs in winter.

INDUCEMENTS TO PRODUCE EGGS IN WINTER.

In rapidly scanning the Dominion the following are the phases presented by the different provinces. In the sections where the winters are comparatively mild, and the procuring of eggs a matter of little difficulty—prices are cheap. On the other hand in those portions where the winter season is more severe and the production of eggs attended with greater difficulty—prices are high. In Montreal new laid eggs command a high figure during December, January, February and the earlier portion of March. Mr. Thomas Hall, poultry breeder, and market gardener of Outremont, a suburb of Montreal, says he has no trouble in obtaining 45 cents per dozen from choice customers for *new laid* eggs during the months mentioned and in periods of scarcity as high as 60 cents is sometimes got, at retail. It is to be remembered that there is great difference in the fresh egg of the grocer which may be several months old, but good enough for cooking purposes, and the new laid egg only two or three days, or even a week old. The flavour of the first named is seriously affected, while it is perfect in the new laid article.

In Toronto, new laid eggs are quoted at 30 cents per dozen by retailers and the *Poultry Review* of the same city, says there is plenty of money in eggs at that price.

From Fort William a correspondent writes "that eggs are at a good price there at any time."

A correspondent at Ashcroft, B.C., says, "The average price of eggs in this locality, all the year round, is 25 cents per dozen."

Another correspondent from the neighbourhood of Calgary, N.W.T., wishes "he had a number of good laying fowls, for eggs here are 50 cents per dozen in winter and command a good price at any time."

From what can be learned there is a good market for new laid eggs at Halifax and St. John, during the winter months.

In our own locality the price obtainable at the grocers for new laid eggs during the cold season is from 30 to 35 cents per dozen according to the severity of the sea-

son: when retailed to special customers they occasionally bring as high as 50 cents per dozen.

And when and where eggs are at their very cheapest there is the British market to be taken into consideration. Speaking of that market a bulletin issued by the Finance Department in relation thereto says "Canadian poultry and eggs which arrived in excellent condition realized the very highest prices in the London market" and again that a leading Canadian dealer who had made a handsome profit out of a shipment of Canadian turkeys expressed himself confident, "that an unlimited, steady and profitable trade can be done in England with Canadian poultry and eggs." The complaints made about some of the shipments were small size of the egg and bad packing. The shipper can easily remedy the latter, but it is only the farmer, who can by breeding the right kind of fowls, put the large egg on the market.

WHEN AND HOW HE CAN DO IT.

After the farmer has taken advantage of the high prices of the winter home market, he can on the return of the warm spring weather—if he has the proper breed of fowls—allow them free range outside. After a short season of rest they will begin to lay again and if non-sitters will continue to do so, until the moulting period begins—in the latter part of the month of September—and which will continue for the next two months. But by this time his layers will have well earned their rest. And by the end of September his early hatched pullets ought to begin to lay. Thus a large number of eggs can be had to put on the best market offering. If he has non-sitters and does not use an incubator and brooder the farmer will have to keep a certain number of one of the sitting breeds to hatch out his chickens. All depends upon intelligent management. And he will require to reserve a certain number of his two-year old hens for breeding purposes. His male bird should be a vigorous yearling cockerel. He should make it a strict rule to allow no male bird among the laying stock. The reason for so doing has been given in report for 1889, p. 107, as follows:—"Take away the male birds from the laying hens. The cock bird is a nuisance in the pen of layers. He not only monopolizes the most of the food, but teaches the hens to break eggs and so learn to eat them. Besides the stimulating diet is too fattening for him and will ruin him as a breeder." The separation of the male bird from the breeding stock during winter, is also insisted upon by a great many of the leading breeders. The experience of five years at the Experimental Farm at Ottawa, when the winter season is long, leads to the same conclusion. But the farmer with one breed and one or two cock birds need have little trouble in keeping the birds apart, if he thinks it necessary so to do in the case of his breeding stock.

DIFFERENT BREEDS.

THEIR APPEARANCE AND CHARACTERISTICS—EGGS, THEIR SIZE AND COLOUR—MARKET CHICKENS.

It will be noticed that the foregoing remarks apply particularly to egg production, but should eggs and poultry be sold by weight throughout the Dominion, a probability of the near future, rapidly maturing chickens, as well as large eggs will be more profitable for the home market. The following information as to the colour and size of eggs laid by the fowls of the different breeds named, as well as to the weight put on per month by the chickens hatched and reared at the Experimental Farm may be useful. Some of the breeds are represented by cuts.

White Leghorns.

An active prolific layer of white eggs. Some strains lay much larger eggs than others. The hens of a good strain will lay eggs $2\frac{1}{4}$ oz. each or 1 lb. 10 oz. to 1 lb. 11 oz. per doz. Pullets' eggs $1\frac{9}{10}$ oz. each, or 1 lb. 8 ozs. per doz. Chickens hardy and grow quickly. Require to be kept active in close confinement and regularly supplied with lime, grit, &c. There is no standard weight for the Leghorn family.

Black Minorcas.

The females lay a large white egg, weighing as follows: Hens, $2\frac{2}{3}$ to $2\frac{1}{4}$ oz. each, or 1 lb. 11 oz. per doz. Pullets' eggs, 2 oz. each, or 1 lb. 7 oz. per doz. The hens lay from 130 to 150 eggs each according to room and range. The chickens are hardy and make vigorous growth. The plumage is jet black. The standard weight of the cockerels must be $6\frac{1}{2}$ lbs.; pullet, $5\frac{1}{2}$ lbs.; cock, 8 lbs.; hen, $6\frac{1}{2}$ lbs. Must be kept busy in winter quarters and regularly supplied with egg shell making material.

Andalusians.

Another member of the Spanish or Mediterranean class but of blue colour in feather. Indeed they are sometimes called the Blue Spanish. They are prolific

layers of large white eggs. Chickens are hardy and grow vigorously, of the same type as the Black Minorcas, and require the same conditions of treatment in winter quarters. Hens' eggs weigh $2\frac{1}{7}$ to $2\frac{1}{4}$ oz. each, or 1 lb. 11 oz. per doz. No weight qualification is demanded by the standard.

Red Caps.

A prolific layer of eggs, of medium size, but not quite so white in shell as those laid by the Leghorn family. Some strains lay larger eggs than others. Dr. Nivin, of London, Ont., claims for his Red Cap hens a yield of 150 eggs in a year. If properly cared for, they lay well in winter. Chickens are hardy and grow rapidly. They are an English breed and have gained many friends.

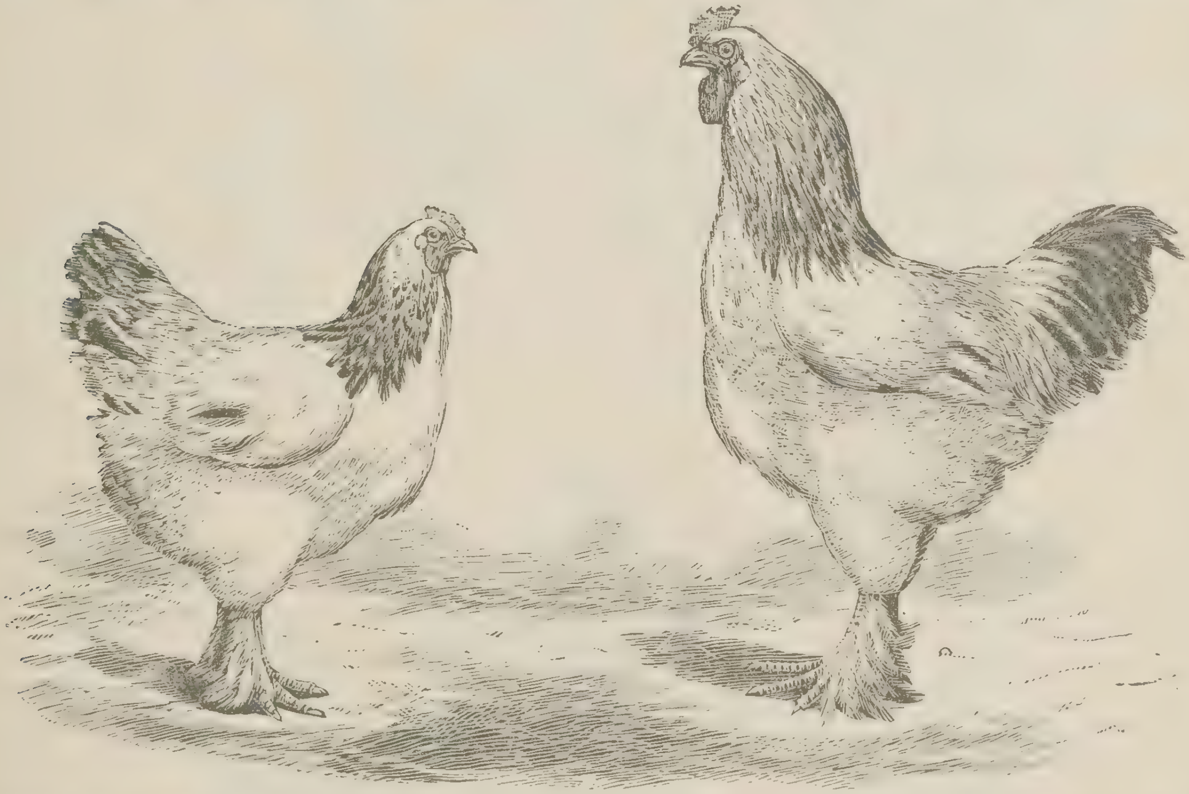
Houdans.

A breed of French origin, but having the five toes of the Dorking. The plumage is mottled black and white and there is a heavy crest on the head. The females lay a large white egg. Hens' eggs $2\frac{1}{4}$ oz. each or 1 lb. 11 oz. to 1 lb. 13 oz. per doz. The flesh is white and of very superior quality and the body of the fowl is plump and heavy. The chickens are hardy, and grow rapidly, the cockerels showing a development of 1 lb. per month. They are great foragers and require range. They do not seem to lay as many eggs during the close confinement of winter. It is the intention, another year, to give a number of pullets of the same age a trial as winter layers. The standard demands the following weights :—Cock, 7 lbs.; hen, 6 lbs.; cockerel, 6 lbs.; pullet, 5 lbs. It will be noticed that the weights are not as great as those called for in the case of the Black Minorcas.

LAYERS OF EGGS OF DARK COLOUR.

Light Brahmas.

Hens are layers of large coloured eggs, in number about 100 to 110 per year. When in winter quarters eggs are not quite so large as when hens are running at large. Hens' eggs from $2\frac{1}{4}$ to $2\frac{1}{2}$ oz. each; per dozen 1 lb. $9\frac{1}{2}$ oz. to 1 lb. 13 oz. Chickens hardy and grow well at development of 14 to 16 oz. per month for cockerels.



Layers require to be kept busy in winter quarters and must not be over fed or will get too fat. They are a very popular breed, being quiet and easily kept in bounds by a low fence. The weights demanded by the standard are: cocks, 12 lbs.; hens, $9\frac{1}{2}$ lbs.; cockerel, 10 lbs.; pullets, 8 lbs. They are classed among the Asiatics.

Buff Cochins.

Of the Asiatic type. A fair layer of richly coloured eggs. Some strains lay much larger eggs than others. At the farm a hen of one strain layed eggs weighing only $1\frac{3}{8}$ oz. each, while a hen of another strain layed eggs $2\frac{1}{4}$ oz. each. They require to be kept active when in close quarters, as they put on fat very easily. The weights are: cock, 11 lbs.; hen, $8\frac{1}{2}$ lbs.; cockerel, 9 lbs.; pullets, 7 lbs. The chickens are hardy

and grow well, showing about the same development as the Light Brahma cockerels. They are great favourites with many fanciers and some very fine specimens are held in Ontario.

Langshans

Are classed as belonging to the Asiatic family. They are a very valuable breed. In England they are much prized as a market fowl on account of their white flesh.

The hens lay a rich dark brown egg of fair size and in goodly number. The chickens are hardy and grow well. The standard demands the following weights: cock, $9\frac{1}{2}$ lbs.; hen, 7 lbs.; cockerel, 8 lbs.; pullet, 6 lbs. Although these weights are necessary to permit of a successful exhibition in the show room, they are as a rule exceeded by the male birds.

Barred Plymouth Rocks.

Plymouth Rocks.

One of the best known breeds on the continent and one of the best for the farmer, who wishes an all round fowl. The pullets and young hens are good layers and the cockerels put on more flesh per month than any breed so far tried at the Experimental Farm. The chickens are hardy and grow well, the cockerels putting on 1 lb. to 1¼ lbs. of flesh per month, when properly cared for and fed. Early pullets will lay at age of five to five and a half months. The laying stock require to be kept busy, and the hens must not be overfed as they get fat very easily. The pullets will stand a little more pushing, as the pullets of all heavy breeds will. The hens make excellent mothers. There are three varieties of this popular breed, viz.: Barred, White and Buff. The latter is a new comer.

Silver Laced Wyandottes.

Another breed of American origin and a great favourite with a great many, on account of their laying and table qualities. The cockerels make good growth, showing a development equal to 14 to 16 oz. per month. They are square and compact in shape. The hens are excellent layers of eggs of fair size: some strains lay large brown eggs, and they make excellent mothers. They come close after the Plymouth Rock as a general purpose fowl. There are three other varieties, the White, Golden and Buff. The white variety is described later on. The weights called for are: cock, 8½ lbs.; hen, 6½ lbs.; cockerel, 7½ lbs.; pullet, 5½ lbs.

THE NEW VARIETIES ON TRIAL.

The White Plymouth Rocks, White Wyandottes and the Coloured Dorkings are the three new breeds on trial at the Experimental Farm. The value of the Dorkings, as table fowls, in Great Britain, is well known, and it is hoped by their numerous admirers that they will be much more extensively bred in this country than they have been. The characteristics of the three breeds are given as follows:—

White Plymouth Rocks.

All the good points of the Barred are claimed for this variety with the additional ones of greater size and whiter appearance of flesh when dressed for market. The latter claim is advanced on the ground that the white "pin" feathers do not show so darkly as in the barred. In order to give them a fair trial, eggs from two of the best strains in the country were procured and from them 17 pullets and 8 cockerels were hatched. The chickens were strong from their hatching out and made good progress, a cockerel hatched on the 20th May last showing 6 lbs. on the 21st September. Two others weighed 4 lbs. 5 oz. and 4 lbs. 8½ oz. respectively. The pullets are large and handsome. So far they are fully equal, if not superior, to the barred in growth and robust health. Careful observation well be made of the one variety as compared with the other. The standard weights required are: cock, 9½ lbs.; hen, 7½ lbs.; cockerel 8 lbs.; pullet, 6 lbs.

White Wyandottes.

A very promising variety, showing so far, all the good points of the Silver Laced. They are claimed to dress better for market on account of the white pin feathers showing less. The same point it may be remembered, is claimed for the White Plymouth Rocks. From eggs of different strains procured, eleven pullets and ten cockerels were hatched. The chicks displayed hardinesss and grew well. A cockerel hatched on the 30th May last, weighed on 2nd October following, 4 lbs.

Two cockerels hatched 12th June, weighed 4 lbs. 6 oz., and 3 lbs. 15½ oz. on 13th October. Other weights were 3 lbs. 14 oz., 3 lbs. 11½ oz., 3 lbs. 10 oz.

The merits of the breed as furnishing early cockerels for market will be seen. Careful note will be taken of the laying qualities of the pullets. The weights required are: cock, 8½ lbs.; hen, 6½ lbs. Cockerel, 7½ lbs.; pullets, 5½ lbs.

Coloured Dorkings.

We have no cut of this favourite English breed. There are three varieties, viz., Coloured, Silver Gray and White. Of these, the Coloured are considered the hardiest, although the breeders of the Silver Gray contend there is no difference. They are a breed that will surely come to the fore on the score of superior quality and quantity of flesh. They are only fair layers. The chickens were equal in hardiness to that of other breeds. A cockerel hatched on the 25th May showed 3 lbs. 8 oz. on the 26th October. An accident resulted in the loss of the other cockerels so that we have the record of only one. The eggs laid by three hens procured last fall were of medium size. The hens show the long compact bodies so characteristic of the breed. The weights by the standard are: cock, 9½ lbs.; hen, 7½; cockerel, 8 lbs.; pullet, 6 lbs Since writing the above a letter was received from Mr. John Dickinson, of Barrie, Ont., in which he states "that with his sons he is breeding Coloured Dorkings with great success, and that at date of letter, 2nd Dec., he had cockerels hatched late in May last, which weighed 9¾ lbs." This is certainly a strong endorsation of the worth of the breed as a market fowl.

EGGS LAID AND THE BREEDS WHICH LAID THEM.

The winter of 1891-92 will be remembered for its severity. In the poultry buildings of the farm the cold was felt as it was almost everywhere else. The lowest temperature was noted in No. 1, or the house wherein the layers were kept, when the temperature went down to 20° below freezing on the night of the 24th December, and it remained so for twelve or fourteen hours afterwards. Outside the thermometer registered 28° below zero, accompanied by a strong and piercing wind from the north-west. In previous reports it has been stated that where the laying stock is kept in cold houses, the food instead of going into eggs is drawn upon to furnish animal heat, and it has been urged upon the farmers to keep their fowls in as comfortable quarters as possible, in order to obtain eggs. Attention is also given to the subject in this report for it is one deserving consideration. It will be interesting then to note the eggs laid by the different breeds under the circumstances as noted. It will be seen that some of the breeds said to be the best winter layers and hardiest of fowls did not prove themselves so. The breeds which did best during the cold season were the Plymouth Rocks, Black Minorcas, Andalusians, Red Caps and White Leghorns, as follows:—

Plymouth Rocks.

There were eleven hens and nine pullets. Of this number seven pullets were separated and reserved for breeding stock. The remainder laid 211 eggs. During January 97, February 53 and March 59. Some of the hens were two years of age and the pullets late.

Black Minorcas.

Of this breed there were four hens and thirteen pullets. The hens and five of the pullets were kept as breeders. The remaining eight pullets laid 213 eggs. In January 89, February 50 and March 74.

ANDALUSIANS.

There were eleven hens and seven pullets of which number five of the hens were used as breeders. The remainder laid during the three first months of the year 182 eggs, viz., January 71, February 72, March 39.

RED CAPS.

There were five hens and six pullets of this breed, three hens and two pullets being reserved as breeders. The remainder laid 165 eggs as follows: January 55, February 69, March 39.

WHITE LEGHORNS.

Of this breed there were seventeen hens and twelve pullets. The most of the hens were old and were kept for breeding from. Seven of the pullets were put into the breeding pen in No. 2 house. The remainder laid 157 eggs, viz., January 32, February 73, March 51.

WYANDOTTES.

Nine hens and six pullets, five pullets being reserved as breeders. The remainder laid 79 eggs, January 25, February 31, March 23.

LIGHT BRAHMAS.

There were six hens and sixteen pullets of this breed. They were all in one pen and were rather crowded. The pullets were of late hatch. The hens did nothing, the pullets seemed at a stand-still during the cold season, and did not begin to lay until the change of season in the beginning of April. The lesson to be learned from the foregoing is that pullets of this breed must be hatched early, so as to have every opportunity to mature before the winter season begins, and they must not be crowded. This has been remarked in previous reports.

LANGSHANS.

There were three hens and eight pullets of this breed. The pullets were late of hatch as in the case of the Brahmas and the same remarks made *re* last named, apply to the former, as their characteristics are about the same. The three hens laid 95 eggs, viz., January 10, February 25, March 27. Several of the pullets were sickly during the early part of the winter and a good deal of trouble was experienced in getting them on their feet and they were never robust. Fine specimens of this breed have been reared this season from superior stock and good results are hoped for, as the breed is a good one.

HOUDANS.

There were eleven old hens of this breed kept for breeding stock and such being the case it would be hardly fair to expect an egg record. These hens did not begin to lay until April.

WHITE LEGHORN-BRAHMA CROSS.

There were six pullets of this cross and one of White Leghorn-Plymouth Rock cross. They were of different ages, some being late. Three pullets laid 75 eggs during the first three months of the year, viz., 42 during January; 30 in February and 3 in March. A number of eggs were eaten during the last named month. In

April when the fowls got out, the egg eating ceased and the seven pullets laid 133 eggs during the month. In April the seven pullets laid 7 eggs *per diem* 5 times; six eggs *per diem* 10 times, five eggs 5 times and the remainder at the rate of 4, 3 and 2 per day. This is excellent laying even for that time of year.

Mixed or Common Fowls.

There were twenty-nine fowls of all ages and size. They were of no particular breed and were kept for sitters only. They were fairly representative of the barn yard fowl of the ordinary farm yard. These fowls were placed in two pens in a cold part of the building but no colder than the fowl house so common in the country. They were fed the same rations as the Plymouth Rocks, Minorcas and Red Caps but they laid few eggs until the month of April when they laid 312 eggs. The record is 32 eggs for January, 37 for February and 18 for March. In April eggs were down to 15 and 17 cents per dozen so that they began to lay when eggs where cheap. It may be said that the mixed fowls were no worse than the Brahma thoroughbreds. But in the case of the latter breed the explanation is given that the pullets were of too late hatch and when they did begin to lay their eggs were worth one dollar per setting to the farm as thoroughbred eggs sold for hatching from.

The total number of eggs laid during the eight months of the year was 6,228. Of this number the months show as follows: January, 434; February, 442; March, 384; April, 1,278; May, 1,563; June, 758; July, 788; August, 581. It will be seen that more than half the total number of eggs were laid—most of them by the pure bred fowls—during the months of April, May and June when they were readily purchased at one dollar per setting for hatching.

The Experience Gained.

The experience of last and previous winters confirms what has been written in previous reports, viz.:

1. Pullets should be hatched out as early as possible.
2. The laying stock should be young and birds of the same age should be in the one pen.
3. A warm or comfortable house is more economical in the long run than a cold one.
4. What will go into eggs in the pullets will make the hens of the heavy breeds too fat to lay.
5. The laying stock require ample room. See instructions on a previous page.

BREEDING PENS MADE UP.

After a very cold winter the weather moderated about the beginning of March, and the breeding pens were made up as follows:—

Breed.	When mated.	No. in Pen.	Remarks.
Brahmas	March 3	1 cockerel, 9 hens	
Plymouth Rocks	do 3	1 cock, 11 hens	
Brahmas (2nd pen)	do 3	1 do 11 pullets	
White Leghorns	do 27	1 do 9 do	
do (2nd pen)	do 25	1 cockerel, 7 hens	
Crosses.			
Langshan-Black Minorca	do 30	1 do 5 do	
White Leghorn-Brahma	April 2	1 do 5 do	

As in previous years the demand for eggs for hatching was much greater than ould be filled, and many disappointments were the result, but the orders were taken n rotation, and as far as possible farmers had first choice.

EGGS SET AND CHICKENS HATCHED.

When set.	Description of Eggs.	Number of Chicks hatched.	When hatched.	Remarks.
April 8.	11 Black Minorca	5	April 29.	From Toronto.
do 19.	8 Red Caps, 3 crosses	7	May 11.	
do 21.	11 Langshans	7	do 13.	From F. A. Mortimer, Pottsville, U.S.
do 24.	13 Plymouth Rock	7	do 17.	
do 29.	13 White Plymouth Rocks	12	do 20.	From Allan's Corners, Q.
do 29.	13 S. L. Wyandottes	6	do 20.	do Todmorden, Ont.
do 29.	13 do	6	do 20.	do do
May 2.	8 W. P. Rocks, 5 Langshans	10	do 23.	do Toronto.
do 3.	13 Red Caps	8	do 24.	do do
do 4.	13 Coloured Dorkings	6	do 25.	do London, Ont.
do 9.	13 White Plymouth Rocks	12	do 30.	do Toronto.
do 9.	13 Langshans	6	do 30.	
do 11.	13 White Wyandottes	10	June 1.	do Kingston.
do 13.	13 Black Minorcas	7	do 3.	do Toronto.
do 17.	13 White Wyandottes	10	do 6.	do Ottawa.
do 18.	8 G. Polands, 5 P. Rocks	12	do 8.	
do 22.	13 White Wyandottes	6	do 12.	
do 27.	13 Red Caps and Plymouth Rocks	9	do 17.	
do 27.	9 Plymouth Rocks, 4 G. Polands	9	do 17.	
do 29.	13 B. Plymouth Rocks	7	do 19.	do Kingston.
do 30.	13 Houdans	12	do 20.	
do 30.	13 Langshans–B. Minorca, cross	12	do 30.	
do 30.	Sundry eggs	9	do 30.	
		195		

Sitters Scarce.

The difficulty in obtaining early sitters clearly proved the necessity of the assistance of a good incubator. It is an every year experience. When sitters become numerous the season is too far advanced to permit of early chickens being hatched out so as to obtain pullets that will lay while the hens are moulting, or early hatched cockerels to make early market chickens. The probabilities are that the time is not far distant when artificial incubation will be well understood and generally practised. The first hen to become broody was a Plymouth Rock, and she was given eleven Black Minorca eggs on the 8th April. The hens were all "set" on board floors covered with two to three inches of sand and earth. Description of the nests used, and the method of setting the hens have been fully described in previous reports. Drink, food and a dust bath were in close proximity to the sitters at all times.

Progress of the Chicks.

The chicks made good progress, considering that the ground has been used for the same purpose for the four previous years. It is the intention to give the newly hatched chickens entirely new ground next spring, a large space having been fenced in for that purpose. After hatching, the chicks were allowed to remain in the nest until thoroughly strong on their legs. Their first food was stale bread soaked in milk and squeezed dry, varied by stale bread crumbs. In a day or two granulated oatmeal was added, then crushed corn and after 12 or 15 days whole wheat. A splendid mash for the rapidly growing youngsters was found to be shorts, cornmeal, bran,

bone meal, and bread and table scraps from the houses of the farm, the whole being mixed up with boiling milk or water. Where milk is in abundant supply it will be found one of the best foods for the growing chicks or the laying hens. Some figures showing the weights made by chickens of certain breeds have been given in a preceding page, but the following may be stated without repetition:—

The most rapid growth was made by a White Plymouth Rock, which hatched on the 20th May, weighed on the 21st October following 6 lbs.; representing a development of 19 oz. per month. This gain may not represent that made in the first month after hatching, but it was subsequently made up.

The next best growth was made by a cross of the Langshan—Black Minorca breeds, the Langshan male being used. This cockerel was hatched on the 11th May, and weighed on the 21st October, 5 lbs. 15 oz. The Barred Plymouth Rocks came next, closely followed by the Wyandottes, both White and Silver Laced. In some cases the weights were the same.

The White and Silver Laced Wyandottes made about the same progress. Both represent a development of 1 lb. per month, taking the heaviest weights. On new ground the figure named should be fairly representative for all cockerels. With special feeding the cockerels might be pushed to a heavier weight. The same may be said of all the breeds mentioned.

The chicks were fed a little and often for the first four or five weeks, and as their size increased and their rations became more solid, they were fed four times daily. Care was taken that the evening ration of grain was a generous one, the object being to keep their crops as full as possible, and for as long as possible during the night. The necessity of pushing their chickens to early maturity has been urged on the farmers in previous reports.

DISEASES OF POULTRY.

Numerous inquiries were received during the year from different parts of the country as to diseases affecting poultry. Satisfactory information was given in almost every case.

On the 7th July last a letter was received from Mr. Hector Chauvin of Montebello, P.Q., stating "that a disease (similar to that of cholera) had shown itself among his chickens. Since the previous Sunday he had lost thirty and he noticed many others which were sickly looking. He feared for the remaining 260."

As the distance was not great and it was known that Mr. Chauvin had valuable chickens, a visit was paid to that gentleman's poultry yard. The disease was found to be a slight diarrhæa caused by acute indigestion, the result of a little overcrowding and too close confinement. It had already been checked by the timely and judicious remedies given by Mr. Chauvin, who is thoroughly up in poultry matters. It was advised that his chickens be allowed free run outside.

Mr. Chauvin has a large and well constructed poultry house, fitted up according to the most approved methods and furnished with all the latest machinery, conveniences, &c. It is doubtful if there is a more completely furnished poultry establishment in the Dominion. Mr. Chauvin sold all the eggs laid by his hens last winter, in Montreal, at 40 cents per dozen.

Suspected Tuberculosis.

The following may be of service to others. On the 21st November ult. Mr. M. Cowley, of Bristol Corners, P.Q., wrote under date of the day previous:

"Sir,—My hens have taken a disease this fall that proves fatal in a month or six weeks time. They first take lame in one leg, then their comb wilts away. They hobble round for a few weeks and die. I opened four of them and found that all their livers were diseased. The livers looked as if they had been covered with hay seed and some were ulcerated. It seems to be more prevalent with my Brown

Leghorn hens. None of the cock birds have it yet, nor have this year's chickens. The sick ones are mostly last year's birds. My hens have the same run as any farm yard fowls. The disease seems to be general round here. I would be glad if you could let me know what to do."

As the disease seemed to affect several localities Mr. Cowley's letter was fowarded to Prof. Wesley Mills, of McGill University, Montreal, and the following reply was received :—

McGILL UNIVERSITY,
MONTREAL, 28th November, 1893.

DEAR SIR,—I am in receipt of your letter of 23rd instant. From the account of the disease given by Mr. Cowley, I should suspect some germ disease, possibly tuberculosis. If you will forward one of the birds to my address as above, as soon after death as possible, I will ask our professor of pathology to kindly make a careful examination.

In any case I would recommend isolation of sick birds and disinfection of the houses in which the fowls have been kept, with a special care to comfort and feeding.

Faithfully yours,

WESLEY MILLS, M.D.

In accordance with the above Mr. Cowley was requested to send the fowl to the address as requested. On the 18th December, Mr. Cowley drove in from Bristol's Corners with a fowl which had died of the disease and the subject was at once forwarded to Dr. Mills. The result of the examination will be awaited with interest.

BEGINNING OF WINTER LAYING.

After enjoying a free run outside, the fowls went into winter quarters during the third week in November. The hens were in most cases over their moult, but some were still very ragged. The White Leghorns were the first to lay followed by the Light Brahmas. Up to date none of the pullets had laid.

THE POULTRY SHOW AT THE INDUSTRIAL.

During the Industrial Exhibition at Toronto, in September last, the meeting of the Ontario Poultry Association held on the 15th of the month named was attended and upon the invitation of the president an address was delivered on "the value of poultry as a means of revenue to the country and to the farmer." The exhibition of poultry, held in the enlarged and improved poultry building of the Exhibition Association, was the best fall show ever seen on the continent at the time of year. The management, arrangement and judging of the birds were simply magnificent.

INCREASED INTEREST IN POULTRY.

Apart from the numerous excursion parties which visited the Experimental Farm during the early part of the season, the increase in the number of farmer visitors to the poultry department and in the interest taken in the same were most gratifying. A largely increased correspondence and demand for plans of buildings; reports containing details as to management of poultry, &c., indicate a more general appreciation of the value of the poultry department as a means of making money.

IMPROVEMENTS.

During the past summer season a large piece of land adjoining the poultry building has been fenced in as part of the department, and will afford change of

ground for the young chicks next season. The cedar posts in front of the main poultry building and in the runs to the rear have been removed and replaced by a light iron posts and wire netting, the whole presenting a very handsome appearance. In the outside runs in rear of the buildings one and three and to the side of No. 2, grass sods have been laid for one-half the runs and the other portions have been boxed off and filled with sand in one part and gravel in the other.

Earth versus Straw Covered Floors.

In No. 1, on main building which contains the laying stock, the floors of the five pens in the south wing have been covered with sand to the depth of three or four inches. A quantity of fine gravel has been mixed with the sand. In the north wing the floors of the five pens are left covered with the straw and chaff heretofore used. The object is to find out the merits of the earth *versus* the straw covered floor. It is presumed the conditions will be more natural, in so far, that better opportunity will be afforded the layers to dust, scratch in, pick up grit, &c., &c., and that while egg laying will be increased, the vices of egg and feather eating will be prevented.

Pullets of different breeds on trial.

A pen of Barred and another of White Plymouth Rock pullets and a pen each of White and Silver Laced Wyandottes are side by side in the south wing of No. 1 house. Note will be taken as to any points of superiority between these different varieties. Trial is also being made of a pen of pullets of the Langshan-Black Minorca cross and other pullets of the White Leghorn-Brahma cross, all of which promise to make good winter layers.

I have the honour to be, sir,

Your obedient servant,

A. G. GILBERT,

Manager Poultry Department.

Central Experimental Farm,
Ottawa, 5th December, 1893.

EXPERIMENTAL FARM FOR THE MARITIME PROVINCES.

REPORT OF WM. M. BLAIR, SUPERINTENDENT.

To WILLIAM SAUNDERS, Esq.,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith the following report of the operations on the Experimental Farm for the Maritime Provinces at Nappan, N.S., during the year 1893.

WEATHER.

The winter of 1892–93 was a cold one. Water pipes that were 4 feet deep in the ground, were frozen in several places. Seeding commenced on April 29th. The spring was fine and dry, with some very warm weather in May. During June the crops suffered much with drought, which continued until July 4th. After that the vegetation was rapid and with good harvest weather the crops were gathered in good condition and were a good average yield.

MANURE.

Some 200 dollars worth of special fertilizers were used, in addition to the farmyard manure. These combined are gradually bringing up the farm to a good state of fertility.

HAY.

The hay was a good crop both on marsh and upland—the former as well as the latter readily responding both in quantity and quality to a more perfect drainage.

About 110 tons of excellent hay was secured in fine condition. This hay, with roots and grain grown on the farm is consumed by cattle and horses.

Thirty-three loads of English hay was secured from 10 acres of upland, while from the marsh land 50 loads of English and 17 loads of broad leaf hay were harvested, there being 30 acres of the former and 16 acres of the latter. The loads averaged 2,200 pounds.

About 10 acres of upland, that was in meadow last year, and yielded 30 tons of hay, was this year devoted to pasturage.

WINTER WHEAT.

Eight varieties of winter wheat were sown in September, 1892, all of which were completely winter-killed, while winter rye sown at the same time on the same kind of land yielded 14½ bushels from ¾ bushel seed sown.

Spring Wheat.

Twenty-nine varieties of spring wheat were sown, as stated below, in plots of one-twentieth of an acre each. Four and one-half pounds of seed (equal to 1½ bushels per acre) was sown on each plot, with the results given.

Name of Variety.	Sown.	Harvested.	Number of days maturing.	Yield per acre. Bush.	Yield per acre. Lbs.	Lbs. per bushel.	Condition when cut.
White Fife	May 4	Aug. 29	117	18	20	55	Long, stiff, bright straw.
Great Western	do 4	do 22	110	25	20	60¼	Long, weak, bright straw.
Hungarian Mountain	do 4	do 23	111	21	00	61½	Medium long, stiff, bright straw.
Defiance	do 3	do 24	113	20	00	60	Long, stiff, bright straw.
Rio Grande	do 3	do 22	111	20	50	61½	do do
White Connell	do 3	do 26	115	25	40	61½	Medium long, stiff, bright straw.
Wellman's Fife	do 3	do 24	113	15	40	57	Short, stiff, bright straw.
Red Fife	do 3	do 22	111	26	20	59¾	Medium long, medium stiff, bright straw.
Herisson Bearded	do 4	do 24	112	21	00	62	Short, stiff, bright straw.
Red Fern	do 3	do 23	112	19	45	62	Medium long, stiff, bright straw.
Ladoga	do 3	do 19	108	21	40	60	Medium long, medium stiff, bright straw.
Pringle's Champlain	do 3	do 21	110	23	20	55	Long, medium stiff, bright straw.
Campbell's White Chaff	do 3	do 16	105	24	40	59	Medium long, stiff, bright straw.
White Russian	do 3	do 23	112	21	40	59½	Medium long, medium stiff, bright straw.
Colorado	do 3	do 19	108	26	40	61	Long, stiff, bright straw.
Hueston's	do 4	do 24	112	20	40	60	do do
Azima, Russian	do 4	do 24	112	10	40	59	Very short, stiff, bright straw.
Black Sea	do 4	do 19	107	20	00	60	Medium long, stiff, bright straw.
Abundance	do 4	do 20	108	22	30	60	Medium long, weak, bright; some lodged.
Beta	do 4	do 19	107	19	40	58½	Medium long, stiff, bright straw.
Alpha	do 4	do 23	111	27	00	58	Long, stiff, bright straw.
Carleton	do 4	do 22	110	24	40	59	Medium long, weak, bright straw.
Ottawa	do 4	do 22	110	22	00	57	Medium long, stiff, bright straw.
Prince	do 4	do 21	109	15	50	60¾	do do do
Advance	do 4	do 21	109	21	30	57	do do do
Stanley	do 4	do 21	109	26	40	60	Long, stiff, bright straw.
Preston	do 4	do 24	112	21	00	59½	Medium long, stiff, bright straw.
Albert	do 4	do 21	109	17	00	59	do do do
Crown	do 4	do 23	111	20	00	60	do do do

Barley.

Eighteen varieties of barley were sown in plots of one-twentieth acre each. Four and three-quarter pounds of seed was sown on each plot, with the results as stated below.

Name of Variety.	Sown.	Harvested	Number of days maturing.	Yield per acre. Bush.	Lbs.	Lbs. per bushel.	Condition of Straw when cut.
Baxter's Six-Rowed.	May 9..	Aug. 10..	93	37	4	$49\frac{1}{4}$	Medium long, stiff, very rusty.
Rennie's Improved..	do 9..	do 11..	94	18	46	$46\frac{3}{4}$	Short, soft, bright.
Odessa	do 9..	do 11..	94	20	00	44	Medium long, soft, bright.
Oderbruch..........	do 9..	do 10..	93	25	00	48	Medium long, stiff, bright.
Mensury...........	do 9..	do 15..	98	19	28	45	Short, stiff, bright.
Two-Rowed Naked..	do 9..	do 19..	102	15	40	59	Short, weak, bright; some lodged.
Guaymalaye	do 9..	do 16..	99	24	18	58	Short, soft, bright.
Thanet... .,.......	do 9..	do 21.	104	22	4	$49\frac{1}{2}$	Short, stiff, bright.
New Golden Grains.	do 9..	do 21..	104	18	26	$51\frac{1}{2}$	Short, weak, bright; some lodged.
Duckbill...........	do 9..	do 18..	101	31	32	$49\frac{3}{4}$	Medium long, stiff, bright.
Prize Prolific	do 9..	do 19..	102	27	4	51	Very short, weak; some rust.
Golden Melon	do 9..	do 22..	105	32	9	$50\frac{1}{2}$	Short, soft, bright; some lodged.
Goldthorpe.........	do 9..	do 22..	105	26	32	$49\frac{1}{2}$	Short, weak, bright.
Canadian Thorpe ...	do 9..	do 18..	101	20	20	49	Short, stiff, bright.
French Chevalier ...	do 9..	do 19..	102	18	16	49	do do
Improved Chevalier.	do 9..	do 19..	102	26	2	$49\frac{1}{2}$	Short, weak, bright.
Common Six-Rowed.	do 9..	do 21.	104	40	00	$47\frac{3}{4}$	Medium long, soft, bright.
Newton	do 9..	do 21..	104	20	00	$48\frac{1}{4}$	Short, stiff, bright.

Two varieties of cross-bred barley received from the Central Farm, Ottawa, of one pound each, were sown with the following results :—

Name of Variety.	Sown.	Harvested.	Number of days maturing.	Lbs. per bushel.	Condition of Straw when cut.
Summit	May 20..	Aug. 24....	96	$48\frac{1}{2}$	Long, weak, bright; lodged.
Surprise......	do 20..	do 24...	96	49	Medium long, weak, bright; some lodged.

Oats.

Forty-three varieties of oats were also grown in plots of one-twentieth acre each; four and a quarter pounds of seed being sown in each case, equal to two and a half bushels per acre, from which the following results were obtained :—

Name.	Sown.	Harvested.	Number of days maturing.	Yield per acre.		Lbs. per bushel.	Condition of Straw when cut.
				Bush.	Lbs.		
Victoria Prize	May 8	Aug. 11.	95	57	2	39½	Long, stiff and coarse, bright.
Rennie's Prize White	do 8	do 11.	95	56	16	37	Short, stiff, bright.
Flying Scotchman	do 8	do 12.	96	67	2	38	Long, weak, bright; some lodged.
Challenge (Webb's)	do 8	do 11.	95	44	24	39	Medium long, stiff, bright.
Early English White	do 8	do 16.	100	48	18	39	do do
Poland White	do 8	do 18.	102	61	26	40½	Medium long, soft, bright.
Bonanza	do 8	do 18.	102	72	32	42	Long, weak, bright; much lodged
Early Racehorse	do 8	do 15.	99	68	8	42½	Long, medium weak, bright; some lodged.
Canadian Triumph	do 8	do 15.	99	64	24	41¾	Long, soft and weak, bright; much lodged.
Welcome	do 8	do 10.	94	54	4	39	Medium long, stiff and bright.
Hazlett's Seizure	do 8	do 10.	94	56	21	39¼	Medium long, medium soft and bright.
Prize Cluster	do 8	do 11.	95	58	8	38	Medium long, weak, bright.
Early Archangel	do 8	do 12.	96	47	22	39¾	Medium long, stiff, bright.
Rennie's New	do 8	do 22.	106	66	21	35	Short, stiff and bright.
Improved Ligowo	do 8	do 17.	101	67	2	36	Medium long, weak, bright; some lodged.
Banner	do 8	do 17.	101	56	16	36½	Medium long, stiff and bright.
Cream Egyptian	do 8	do 18.	102	89	14	39	Long, soft, bright; some lodged.
Early Blossom	do 8	do 16.	100	64	24	35	Long, stiff, bright.
American Beauty	do 8	do 14.	98	47	22	36	Short, stiff, bright.
Early Etampes	do 8	do 19.	103	64	4	35	do do
Joanette	do 9	do 19.	102	51	16	35	do do
Prolific Black California	do 9	do 19.	102	56	16	35	Long, weak, bright; some lodged.
Prolific Black Tartarian	do 9	do 18.	101	63	18	36¼	Long, soft, bright.
Abundance	do 9	do 17.	100	50	20	36¼	Medium long, stiff, bright.
Doncaster Prize	do 9	do 14.	97	50	20	37	do do
Holstein Prolific	do 9	do 16.	99	68	8	38	Long, soft, bright; some lodged.
Improved Black Tartarian	do 9	do 18.	101	52	32	35¼	Long, stiff, bright.
Early Gothland	do 9	do 18.	101	50	30	39½	do do
Rosedale	do 9	do 15.	98	55	10	40	Medium long, stiff, bright.
Black Brie	do 9	do 24.	107	44	24	33	do do
Giant Cluster	do 9	do 24.	107	62	22	34	Long, weak and bright; lodged.
Black Coulommiers	do 9	do 25.	108	60	00	35¼	Medium long, stiff, bright.
Golden Beauty	do 9	do 19.	102	57	2	35	Long, weak, bright; some lodged.
Oderbruch	do 9	do 19.	102	58	8	39	Long, stiff, bright.
Scottish Chief	do 9	do 10.	93	63	18	40	do do
Siberian	do 9	do 23.	106	55	10	35½	Long, medium weak, bright.
Cave	do 9	do 18.	101	61	6	37	Medium long, stiff; some rust.
Abysinnia	do 9	do 18.	101	56	16	39	Long, stiff, bright.
Wide Awake	do 9	do 18.	101	57	22	35	Long, weak, bright; lodged.
Imported Irish	do 9	do 17.	100	54	4	39	Medium long, soft, bright; some lodged.
Columbus	do 9	do 18.	101	52	12	34	Short, soft, bright; some lodged.
White Wonder	do 9	do 11.	94	58	28	39¾	Long, weak and bright; some lodged.
American Triumph	do 9	do 23.	106	51	26	37¼	do do

Early and Late Sowing.

In order to test the relative value of early and late sowing, a field was laid off in plots of one-tenth of an acre each and sown at four different times, commencing on May 10th, one week intervening between each sowing, the same kind of grain in all cases being sown. There were two plots each of wheat, barley and oats. The following table gives the results.

WHEAT SOWN AT DIFFERENT TIMES.

Nine pounds to each plot.	Sown.	Harvested.	Bushels per plot.	Lbs. per bushel.
1. Campbell's White Chaff	May 10	Aug. 26	1¾	60¾
Red Fife	do 10	do 26	1¾	57
2. Campbell's White Chaff	do 17	do 29	2	58¼
Red Fife	do 17	do 28	1¾	55
3. Campbell's White Chaff	do 24	do 30	2	58
Red Fife	do 24	Sept. 2	1¾	52½
4. Campbell's White Chaff	do 31	do 2	¾	47
Red Fife	do 31	do 4	½	45

BARLEY SOWN AT DIFFERENT TIMES.

Nine and a half pounds on each plot.	Sown.	Harvested.	Bushels per plot.	Lbs. per bushel.
1. Duckbill	May 10	Aug. 21	3	52
Baxter's Six-Rowed	do 10	do 11	3¼	47
2. Duckbill	do 17	do 26	2¾	51
Baxter's Six-Rowed	do 17	do 18	1¾	47
3. Duckbill	do 24	do 28	3¼	49
Baxter's Six-Rowed	do 24	do 22	2¾	46
4. Duckbill	do 31	do 30	¾	43¾
Baxter's Six-Rowed	do 31	do 26	1	46

OATS SOWN AT DIFFERENT TIMES.

Eight and a half pounds on each plot.	Sown.	Harvested.	Bushels per plot.	Lbs. per bushel.
1. Banner	May 10	Aug. 19	5½	37
Prize Cluster	do 10	do 18	3¾	40
2. Banner	do 17	do 22	5½	34
Prize Cluster	do 17	do 21	3¼	40
3. Banner	do 24	do 27	5	35
Prize Cluster	do 24	do 26	3¼	39
4. Banner	do 31	do 30	3	32
Prize Cluster	do 31	do 29	2½	38½

Pease.

Ten varieties of pease were sown in plots of one-twentieth acre each, with results as given in the following table:—

Name, and pounds of Seed sown.	Sown.	Harvested	No. of days maturing	Yield per acre. Bush.	Yield per acre. Lbs.	Lbs. per bush.	Condition when cut.
Black-eyed Marrowfat— 10½ lbs., or 3½ bush. per acre.	May 10..	Aug. 20..	102	34	00	60	Vines made a strong growth.
Mummy— 9 lbs., or 3 bush. per acre....	do 10..	do 16..	98	32	00	61	Vines very strong growth.
Crown— 7½ lbs., or 2½ bush. per acre..	do 10..	do 14..	96	35	20	59	Vines made a very strong growth.
Golden Vine— 7½ lbs., or 2½ bush. per acre..	do 10.	do 14..	96	33	20	60	Vines, strong growth and stiff.
Multiplier— 7½ lbs., or 2½ bush. per acre..	do 10.	do 18..	100	38	40	63	Medium strong growth of vines.
Centennial— 9 lbs., or 3 bush. per acre....	do 10..	do 18..	100	33	00	62	Long vines and heavy growth.
Prince Albert— 7½ lbs., or 2½ bush. per acre..	do 10..	do 19..	101	34	20	61	Small vines; medium strong.
Pride— 9 lbs., or 3 bush. per acre....	do 10..	do 11..	93	31	20	61	Vines strong; heavy growth.
Potter— 7½ lbs., or 2½ bush. per acre..	do 10..	do 17..	99	27	20	60½	Large vines; good growth.
Rennie's No. 10— 10 lbs., or 3⅜ bush. per acre..	do 10..	do 17..	99	37	20	63	Vines made a strong growth.

Turnips.

Eleven varieties of turnips were sown in plots, consisting of three rows, 30 inches apart and 66 feet long, of each kind, on May 22nd. Duplicate plots of the same varieties were sown on June 6th. The following table gives the results, showing that all the varieties excepting Skirving's Purple Top, gave a larger yield from the earlier sown plots:—

Name of Variety.	1st Plot Sown.	2nd Plot Sown.	1st Plot Pulled.	2nd Plot Pulled.	1st Plot, Weight. Lbs.	2nd Plot, Weight. Lbs.
Selected East Lothian..............	May 22..	June 6..	Oct. 18 .	Oct. 18..	735	435
Sutton's Champion..................	do 22..	do 6..	do 18..	do 18..	750	505
Mammoth Purple Top.................	do 22..	do 6..	do 18..	do 18..	480	355
Carter's Prize Winner..............	do 22..	do 6..	do 18..	do 18..	775	503
Steele's Selected Purple Top.......	do 22..	do 6..	do 18..	do 18..	700	645
Jumbo or Monarch...................	do 22..	do 6..	do 18..	do 18..	865	550
Carter's Elephant..................	do 22..	do 6..	do 18..	do 18..	555	410
Marquis of Lorne...................	do 22..	do 6..	do 18..	do 18..	745	475
Bangholm...........................	do 22..	do 6..	do 18..	do 18..	755	515
Skirving's Purple Top..............	do 22..	do 6..	do 18..	do 18..	528	605
Prize Purple Top...................	do 22..	do 6..	do 18..	do 18..	475	350

MANGELS.

Ten varieties of mangels were sown in plots of three rows, 30 inches apart and 66 feet long, of each kind. These were sown on May 22nd, and a duplicate plot of each kind was sown on 6th June, with the following results:—

Name of Variety.	1st Plot Sown.	2nd Plot Sown.	1st Plot Pulled.	2nd Plot Pulled.	1st Plot Weight.	2nd Plot Weight.
					Lbs.	Lbs.
Gate Post or Long Red	May 22	June 6	Oct. 17	Oct. 16	415	450
Pearce's Canadian Giant	do 22	do 6	do 17	do 16	260	370
Giant Yellow Intermediate	do 22	do 6	do 17	do 16	455	550
Champion Yellow Globe	do 22	do 6	do 17	do 16	430	400
Red Globe	do 22	do 6	do 17	do 16	325	275
Golden Tankard	do 22	do 6	do 17	do 16	560	370
Red Fleshed Tankard	do 22	do 6	do 17	do 16	275	340
Erfurt Model	do 22	do 6	do 17	do 16	456	360
Warden Orange Globe	do 22	do 6	do 17	do 16	250	205
Mammoth Long Red	do 22	do 6	do 17	do 16	305	475

CARROTS.

Ten varieties of carrots were sown on 22nd May in three rows, each 66 feet long and 24 inches apart, with duplicate plots of each variety sown on June 6th. The results were as stated below:—

Name of Variety.	1st Plot Sown.	2nd Plot Sown.	1st Plot Pulled.	2nd Plot Pulled.	1st Plot, Weight.	2nd Plot, Weight.
					Lbs.	Lbs.
Improved Short White	May 22	June 6	Oct. 17	Oct. 16	400	220
Large Short Vosges	do 22	do 6	do 17	do 16	295	130
Mam. White Intermediate	do 22	do 6	do 17	do 16	525	202
Guerande or Oxheart	do 22	do 6	do 17	do 16	315	110
Early Gem	do 22	do 6	do 17	do 16	333	140
Chantenay	do 22	do 6	do 17	do 16	232	140
Half Long, Danver's	do 22	do 6	do 17	do 16	270	155
Long Red (without core)	do 22	do 6	do 17	do 16	193	78
Carter's Orange Giant	do 22	do 6	do 17	do 16	280	182
White Belgian	do 22	do 6	do 17	do 16	245	100

SUGAR BEETS.

Four varieties of sugar beets were sown in three rows, each 66 feet long and 30 inches between the rows, with the results as given below:—

Name of Variety.	Sown.	Pulled.	Weight.
			Lbs.
Vilmorin's Improved	May 22	Oct. 19	214
French New Rich	do 22	do 19	126
Klein Wanzleben	do 22	do 19	104
Green Top Brabant	do 22	do 19	248

Mixed Grain for Feed.

Two kinds of mixed grain were sown on one-tenth acre plots, to be cut green and cured for hay, with the following results:—

No. 1. *Mixture sown May* 11. *Harvested August* 11.

—		Weight.	
		Green.	Dry.
		Lbs.	Lbs.
5 lbs. Prize Prolific Barley 6 do Golden Vine Pease 3½ do Banner Oats	1 bushel each per acre	1,140	553

No. 2. *Mixture sown May* 11. *Harvested August* 11.

—		Weight.	
		Green.	Dry.
		Lbs.	Lbs.
6 lbs. Golden Vine Pease 6 do Red Fife Wheat 3½ do Banner Oats	1 bushel each per acre	960	430

Corn.

Nine varieties of corn were sown in two rows each, in hills 3 feet apart each way 66 feet long, and in rows 3 feet apart and 66 feet long, with the following results:—

Name of Variety.	Sown.	Harvested	Weight in rows, pounds.	Weight in hills, pounds.	Condition when cut.
Compton's Early	May 24	Sept. 27	500	475	Glazed.
Golden Dew Drop	do 24	do 27	400	520	Silking.
Mastodon Dent	do 24	do 27	505	420	do
Pearce's Prolific	do 24	do 27	250	305	Soft glazed.
Smut Nose Flint	do 24	do 27	450	410	Silking.
Mitchell's Extra Early	do 24	do 27	260	280	Glazed.
Angel of Midnight	do 24	do 27	550	335	Silking.
Thoroughbred White Flint	do 24	do 27	465	400	Tasselled.
North Dakota	do 24	do 27	260	475	do

The Robertson Combination for Ensilage.

Two acres of corn and beans of this combination were sown on May 23rd, also one-half acre of Russian sunflowers, and were cut on Sept. 23rd and 25th.

The corn and beans weighed when wilted two days 28,060 pounds, and the sunflower heads weighed 3,635 pounds.

The land was prepared the same as for turnips, being in grain last year, ploughed in the fall, manured this spring with forty 30 bushel cart loads of manure from the barn-yard per acre well ploughed in and cultivated, 2 barrels of superphosphate per acre was sown broadcast and then harrowed in. The seed was then sown

with the seed drill 3 feet apart in the rows, with 2 to 4 seeds per foot. About one-half of the corn germinated, and made slow growth. The beans all grew well.

The corn was badly broken down by a storm on August 23rd, but it did not appear to damage the beans so much. The corn was in the milk stage when cut, and some of the beans on the lower part of the stalks were ripe.

It was evident that the same kind of corn grew better that was planted in plots without the beans, but we thought the beans grown alone did not appear to be so vigorous, as those grown among the corn.

POTATOES.

Forty-nine varieties of potatoes were planted in two rows, each 66 feet long; dates of planting, May 21st to 23rd; dates of digging, Sept. 13th and 14th; results as given below; sets, 2 to 3 eyes; 1 foot apart.

Varieties.	Weight, sound in pounds.	Weight, rotten in pounds.	Colour of Tubers.	Remarks.
Everett	184	10	Light pink	Medium long, oval, medium late.
Daisy	85	12	White and pink eyes	do large, smooth, round late
Clarke's No. 1	138½	19½	White and pink	do long, smooth, late.
Empire State	168	7	White	Large, smooth, late.
Thorburn	168	20	Light pink, white eyes	Medium, smooth, late.
Early Sunrise	143½	13	Pink	Large, smooth, early.
Sharpe's Seedling	166	14½	White	Long, large, late.
Crown Jewel	132	41½	Pink and white	Oval, medium, large, early.
Holborn Abundance	218	....	White	Large, long, late.
Lee's Favourite	143½	19	Pink and white	Long, smooth, early.
Vanguard	61½	33	do	Oblong, smooth, late.
Algoma No. 1	113	32	do	Large, oval, early.
Early Ohio	164	9	Light pink	Long, oval, early.
Northern Spy	169	6	Red	Large, long, flat, late.
Dakota Red	185	2	do	Large, round, late.
Early Rose	140	6	Pink	Long, oval, early.
State of Maine	197	13½	White	Large, long, flat, late.
Early Puritan	155½	19	White and pink	Long, smooth, early.
Burpee's Extra Early	117	28½	Pink and white	Medium long, round, early.
Chicago Market	161	3	Pink	Long, oval, late.
Beauty of Hebron	122	24	White	Oblong, smooth, early.
Rural Blush	165	....	Pink	Long, round, late.
Delaware	172	13½	White	Large, round, late.
London	142	10½	Pink	Medium large, oval, early.
Polaris	136	18	White	Oblong, smooth, medium early.
Bruce's White Beauty	114½	16	do	Medium large, oval, early.
Toronto Queen	115	4	Light pink	Small, smooth, oblong, early.
Earliest of All	108	27	White	Medium large, oval, early.
American Giant	192	9	do	Long, large, deep eye, late.
New Variety No. 1	160	1	Pinkish white	Long, round, deep eye, med. late.
I. X. L	144	8	White and pink	Medium large, long, early.
Pearce's Extra Early	155	11	White, some pink	do do do
Stray Beauty	160	2½	Red	Round, smooth, early.
Rural New Yorker No. 2	88	....	White	Smooth, round, late.
Sugar	99	1	do	Small, round, late
Richter's Imperial	125	42	Pink	Long, oval, late
Rosy Morn	126	11	Dark pink	Medium large, round, early.
Rose's New Giant	130	7	White	Large, long, flat, late.
Late Goodrich	135	10	do	Round, with deep eyes, late.
Compton's Surprise	128	....	do	Large, long, smooth, late.
Richter's Schneerose	158	6½	do	Large, rough, late.
Early White Blue	65	3½	White and blue	Small, round, early.
Dixon's Early	147	12	White and pink	Medium large, oval, early.
Richter's Elephant	111½	8	Light pink	Long, smooth, early.
Lizzie's Pride	92	16	White pink	Large, long, oval, late.
Munro County	123	10	Light pink	Long, rough, late.
Early Gem	154	7½	Pink	Long, oval, early.
Acadian	145½	....	Blue	Large, flat, late.
Muchonic	120	....	White and pink	Large, round, late.

Cut Potatoes for Seed.

Six different ways of cutting potatoes for seed purposes were tried, and the following results obtained. Taking everything into consideration, the pieces with three eyes gave the best results.

Number of Eyes.	Planted.	Dug.	Weight in pounds.	Remarks.
One eye	May 23	Sept. 14	44½	Even lot; very few small.
Two eyes	do 23	do 14	44	do do
Three eyes	do 23	do 14	66	do do
Cut in half lengthwise through the seed end	do 23	do 14	68	do some small.
Cut in half crosswise, seed end whole	do 23	do 14	70	Some very large and some very small.
Whole potatoes	do 23	do 14	63	Even, some few small

Bordeaux Mixture for the prevention of Potato Rot.

The following table gives the results of experiments carried on with the Bordeaux mixture as a fungicide, as applied to potatoes for the prevention of rot. The first application was made on July 28th and a second one on August 12th. For this purpose a plot of thirteen different varieties, embracing both early and late kinds was selected. This plot was divided across the middle and one-half treated, the other half was left untreated.

The mixture used was ready prepared and applied according to directions given —one pound to five gallons of water: this mixture did not appear to be so strong as the Bordeaux mixture formerly used here, the formula for which is given in the report of 1892.

Both of these mixtures were applied in the same way, with a sprayer, and the mixture tried this year did not give as good results as that formerly used.

Bordeaux Mixture.

Names of Varieties.	Treated.		Not treated.	
	Sound.	Rotten.	Sound.	Rotten.
	Lbs.	Lbs.	Lbs.	Lbs.
Dixon's Early	89	4	86½	8
Everett	134	1	96½	9
Sharpe's Seedling	108	5	84½	9½
Burpee's Extra Early	97	8	68	20½
Early Ohio	117	2	92	7
Richters Elephant	61	2	59	6
Bruce's White Beauty	74	10	65	6
Polaris	84	10	81	8
Daisy	68	9	42½	3
New variety No. 1	84	0	56	1
Vanguard	46	11	36	22
Northern Spy	92	2	103	4
Holborn Abundance	132	0	112	0

Broom Corn.

Three varieties of broom corn were sown on May 20, and grew well and just began to tassel out when killed with frost.

Names of Varieties.	Height of growth.	Remarks.
	Feet.	
Improved Dwarf	$3\frac{1}{2}$	Season too short for it to mature, but it reached a good growth.
California Golden	5	
Long Brush	....	
Long Brush Evergreen	$4\frac{1}{2}$	

Beans.

Seven varieties of beans were planted in small plots, with results as given below. The Early Dun Coloured has proved to be one of the best ripening sorts, and yielding heavy, while the Seville Long Pod ripened and yielded the best of the several sorts tried.

Names of Varieties.	Planted.	Pulled.	Condition when pulled.
Early Dun Coloured	May 24	Sept. 27	Very early; all ripened.
Crystal White Wax	do 24	do 27	Medium early; one-half ripened.
Best of All	do 24	do 27	Only part ripened.
Golden Wax	do 24	do 27	Fairly early; not one-half ripened.
Common Long Pod	do 24	Oct. 9	Three-quarters ripened.
Seville Long Pod	do 24	do 9	Nearly all ripened well.
Early Mazagan	do 24	do 9	One-half ripened.

Millet.

Three varieties of millet were sown, but failing to get well started before the drought, in the early part of the season, which seemed to affect it, it failed to mature. The varieties sown were Pearl, White French and American.

Hemp.

One variety of hemp was sown on May 20th and grew remarkably well, reaching a height of $3\frac{1}{2}$ feet; the seed ripened and was secured.

Flax.

One half bushel of Russian flax was sown on May 24th and cut on August 22nd from which 6 bushels of good seed was obtained.

Buckwheat.

Silver Hull buckwheat was the only kind grown this year, 3 acres were sown which gave a return of $104\frac{1}{2}$ bushels. This has proven to be the most profitable buckwheat grown here. It was sown on May 27th and cut August 27, and filled out well.

Winter Rye.

One-half acre was sown in winter rye, September 9th in the fall of 1892, which grew well, yielding $14\frac{1}{2}$ bushels from $\frac{3}{4}$ bushel sown, weighing 55 pounds per bushel. Two and one-half bushels were sown this fall which it is proposed to experiment with as to its value as an early green feed for stock.

Cauliflower.

Fifteen varieties of cauliflowers were transplanted from the hotbed and made very good growth. Among the best varieties noticed were the Early Snowball, Extra Early Dwarf Erfurt, Thorburn's Nonpareil, and Autumn Giant. The following table gives character of the growth:—

Name of Variety.	Remarks.
Gilt Edge	Fair growth; very early; small heads.
Le Normand Short Stem	Good growth; medium early; large heads.
Thorburn's Nonpareil	Strong growth; medium early; large firm heads.
Early Dwarf Erfurt	Fair growth; early; large heads.
Early Paris	Fair growth; early; solid medium heads.
Large Early Dwarf Erfurt	Good growth; medium early; large heads.
Large Early London	Strong growth; medium early; fair heads.
Extra Early Dwarf Erfurt	Medium growth; very early; large firm heads.
Half Early Dwarf French	Fair growth; medium late; medium heads.
Italian Taranto	Strong growth; late; good solid heads.
Autumn Giant	Very strong growth; late; large firm heads.
Stadtholder	Medium growth; late; medium heads.
Early Snowball	Strong growth; early; large fine heads.
Large Algiers	Medium growth; late; fair heads.
Early Walcheren	Medium growth; medium early; good heads.

General Statement of Crops.

Fifty-six acres in hay land grew 110 tons, and in addition to the plots of grain for testing purposes which yielded 248 bushels, there were 10 acres in oats and pease which gave 453 bushels, and 3 acres in buckwheat which gave $104\frac{1}{2}$ bushels, making in all $805\frac{1}{2}$ bushels of grain grown this year.

The plots of roots gave 577 bushels, and in addition, there were 5 acres in turnips which yielded 4,620 bushels, making in all 5,197 bushels of roots.

Three acres were sown with corn, beans and sunflowers for ensilage; 4 acres were devoted to grain crops for feeding purposes during the summer months.

About 3 acres were in small fruits, nursery and shrubbery. The remainder of the cleared land was devoted to pasturage.

Drainage and its advantages.

Nine acres of land has been underdrained this year: this with that previously drained, makes 70 acres of the farm thoroughly underdrained. This work has cost an average of about $50 per acre, including main drains with from 8 to 4-inch tiles; about 49 acres are laid with 3-inch tiles, the remainder with 2-inch. They are principally 30 feet apart and 3 feet deep, in some of the land that was very boggy they are 20 and 22 feet apart, while 7 acres are drained with tiles placed 24 feet apart and $2\frac{3}{4}$ feet deep.

In some cases where the land was uneven, the drains had to be deepened in places to insure a gradual fall, this being necessary in all underdrains. To accomplish this object, it was necessary in one place to lay a main drain of 4-inch tiles

9 feet deep, and in another an 8-inch main drain was laid for several rods 8 feet deep, while in other places the drains are from 4 to 5 feet deep.

Tiles landed on the farm cost, including freight:

2 inch,	$13.00	per M.
3 "	18.00	"
4 "	24.00	"
6 "	45.00	"

The advantages of draining are very many, about 10 days earlier seeding, consequently earlier ripening, when the weather is more suitable for harvesting.

The land is more easily worked and this insures better cultivation than is possible on wet land.

During heavy rains all surplus water is carried away rapidly, the land retaining a sufficient quantity for nourishment; and thus by making the water level lower, the plants are enabled to feed at a greater depth, making more plant food available, thereby providing food and nourishment for crops during severe drought.

The following statement shows cost of draining $3\frac{6}{10}$ acres of land, fertilizers used; also yield of turnips grown on the same.

Cost of draining per acre	$ 54 28	
Cost of draining $3\frac{6}{10}$ acres		$ 195 41
Fertilizers used—		
9030-bush. cart loads manure @ 80c	$ 72 00	
2,160 lbs. bone meal @ 2c. per pound	43 20	
700 lbs. guano @ 3c. per pound	21 60	
		136 80
Total cost		$ 332 26

Yield of turnips per $3\frac{6}{10}$ acres, 3,600 bushels; 3,600 bushels @ 10c. per bushel, $360.00, showing a balance of $27.79 on $3\frac{6}{10}$ acres, or a balance of $7.72 per acre towards cost of labour.

Grasses.

Of the 30 varieties of grasses tried on the farm 11 varieties appear to be suitable to the climate, and from their appearance I think some of them would be valuable if added to our pasture grasses. I have carefully saved the seed from these plots and am now trying them on a field which is being prepared for permanent pasture.

The following are the most suitable varieties: Western Rye Grass, Orchard Grass, Italian Rye Grass, Late or Fowl Meadow, Fringed Brome, Reed Canary, Western Brome, Austrian Brome Grass, Tall Fescue, Meadow Fescue and Red Top.

Strawberries.

The following varieties of strawberries fruited this year: Crescent, Capt. Jack, New Dominion, Manchester, May King and Maggie.

The following varieties were sent here from the Central Farm in May last, and have made good growth, viz.: Sharpless, Warfield and Bubach. There was also a large variety of plants sent from the Central Farm in August last, some of which are living, but many failed to root, and from the experience gained here it appears that May is the best time to transplant strawberries, in this climate.

Raspberries.

Raspberries and blackberries always make good growth. The new wood this year overshadowed the fruit before it was ripe. In some cases the canes were seven feet high;—this rapid growth appeared to injure the fruit.

Gooseberries and Currants.

Ten varieties of currants were received from the Central Farm last May, these have made good growth and will be further reported on another year.

Nineteen varieties of gooseberries were also received, nearly all of which are growing well.

Nuts.

Two varieties of filbert nuts, Cosford Cob and Kentish Cob were sent from the Central Farm last season and are growing well.

Poultry.

There are now on the farm fifteen White Leghorn fowls and one pair of Plymouth Rocks, and it is proposed to add other breeds shortly.

Ornamental Trees and Shrubbery.

All the ornamental trees and shrubs previously planted here are growing well and others have been set out this year. The young forest trees in the nursery are growing remarkably well.

Hungarian Wheat.

A small package of Hungarian wheat was sent from the Central Farm. It received all possible attention, but failed to head and has all the appearances of winter wheat.

Buildings.

The dairy room in one of the buildings, was fitted up in the spring with the necessary appliances to care for the milk until the dairy station was completed on the 1st of July. It is now used for cleaning cans, pails, and keeping the milk over night: we find this a very useful and convenient building.

We also found it necessary to have some of the cattle and horse stalls repaired; the floors in some cases were worn out and decayed.

Stock.

No cattle were bought for feeding experiments last year. A few young steers, which were raised on the farm, were sold in the spring for beef.

Of the thorough-bred cattle now on hand, there are four Shorthorn cows and one bull. A year old bull was sold last spring to the Earltown Agricultural Society.

There are also two Ayrshire cows and one heifer calf and one bull; also two Holstein cows, one heifer (yearling) and two bulls. A bull calf was sold last spring to James Frie, Shediac.

The remaining cattle, 52 in all, are grade cows, steers, and calves.

The surplus milk, after feeding the calves and supplying five families on the farm with milk has been delivered at the dairy station since July 3rd to be converted into cheese and butter.

Five horses are found necessary to carry on the work of the farm, and a pair of one-year-old colts are being raised.

A Yorkshire boar and sow were sent from the Central Farm, also a Berkshire boar. There are in addition 6 Berkshire sows, also five young grade pigs.

Fruit Trees.

An orchard was commenced three years ago, and additions have been made to it each spring since until now there are 222 apple trees, consisting of 72 varieties; 90 plum trees, 26 varieties; 90 cherry trees, 29 varieties; 62 pears, 21 varieties; 26 crab apple trees, 7 varieties; in all 481 trees, covering about 12 acres. These trees are making good healthy growth, they do not make wood fast, but with few exceptions are growing stout and strong.

Some have commenced to bear. The Longfield has borne for 2 years a small hard apple, but the wood appears weak, and the limbs having fruit on them break easily with the wind. The Wagener, Scott's Winter, Red Astrachan, Yellow Transparent, Maiden's Blush, Tetofsky and Borovinka fruited this year. A heavy storm of rain and wind on August 22nd shook the young trees very badly, blowing off much of the fruit and breaking some of the branches.

The canker worm and bark lice are the most troublesome pests so far.

Meetings attended.

I attended a farmers' meeting at Belmont on January 12th; was at a meeting of the Farmers and Dairymen's Association of New Brunswick, at Fredericton, on 26th and 27th of January; at the farmers and dairymen's meeting at Truro on March 15th and 16th, also a meeting of Provincial Grange at Bass River, N.S., on June 27th.

Exhibitions attended.

I exhibited grain in straw and in glass bottles, grasses, potatoes and beans at Pictou exhibition held on 19th, 20th and 21st of September, and also at Charlottetown on the 26th, 27th, 28th and 29th of September, in all about 127 varieties of grains and grasses and 49 varieties of potatoes were shown.

I also attended the Sackville exhibition on 13th of October.

I have the honour to be, sir,

Your obedient servant,

WM. M. BLAIR,

Superintendent.

EXPERIMENTAL FARM FOR MANITOBA.

REPORT OF S. A. BEDFORD, SUPERINTENDENT.

BRANDON, MAN., 30th November, 1893.

To WM. SAUNDERS, Esq.,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith my sixth annual report of the experiments undertaken and work accomplished on the Brandon Experimental Farm during the past eleven months.

GENERAL VIEW, EXPERIMENTAL FARM, BRANDON, MAN.

The past spring will be long remembered as one of the most backward ever experienced in this part of the province. The first wheat sowing was done on this farm on 1st May, fully two weeks later than the average season. But spring once opened the weather was all that could be desired and growth was very rapid, and prospects for a heavy crop were excellent, until 15th July, when dry weather accompanied with extremely hot winds set in, the thermometer reaching 106·4 in the shade on 7th August, and all vegetation received a severe check.

The land on the Experimental Farm being in a good state of cultivation did not suffer as badly as the average farms in this section, still the berry of the earlier varieties of wheat grown on the farm, was greatly shrunken, and the returns especially of hay, roots and fodder plants would have been much larger, but for the drought and hot winds of July and August followed by a dry autumn.

The past season has emphasized the necessity in this portion of the province of a shorter course of rotation than is generally adopted, it is questionable whether more than two, or at the most three crops should be grown on the same land without summer fallow; properly summer-fallowed land is not only freer of weeds, but retains moisture to a much greater extent than loose land filled with unrotted stubble, a condition that obtains in most of the land here when cropped for several years in succession.

This fall in digging drains through stubble land the soil was found almost perfectly dry for 5 and 6 feet deep, while in summer fallow the soil was found quite moist for the same depth.

As a result of the high temperature and bright weather, there has been an almost total absence of injury from rust or fall frost, the first severe frost was experienced on the 16th September when the thermometer showed 8 degrees of frost, at that date even the latest sown wheat was cut and out of danger.

In addition to the repetition of some former experiments so necessary to the reaching of accurate conclusions, a quantity of entirely new work, much of it arranged so as to meet suggestions made by farmers of the province, has been undertaken this year.

RESULTS OF TESTS WITH VARIETIES OF WHEAT.

In addition to the varieties tested on this farm for the past four years a number of new varieties, principally cross-bred wheats, have been tried here this year for the first time. These wheats were originated at the Central Experimental Farm, are nearly all early maturing varieties and were in the milk stage when the hot winds of the 7th August prevailed, and for that reason the kernel was greatly shrunken and the yield reduced; and being nearly ripe at the time of a severe wind storm which occurred on 14th August, when much of the grain was beaten out, the yield was reduced from this cause also.

It will be noticed that nearly all these varieties are early and many of them have short bearded heads.

The Stanley and Alpha are exceptions, having fair sized bald heads and are thus far the most promising of the series.

The accompanying table gives full particulars regarding the test of varieties of wheats for this year.

As all the varieties stood up equally well, the column giving the character of straw is omitted this year.

Test of Thirty-nine Varieties of Wheat.

Sown in the valley, 3rd May; soil, black loam, summer fallow, sown with common drill, 1½ bushels per acre, bluestoned, no smut; size of plots, one-tenth acre.

Variety.	Length of straw.	Kind of head.	Length of head.	No. of days maturing.	Rust.	Ripe.	Yield per acre.		Lbs. per bush.
	Inch.		Inch.				Bush.	lbs.	Lbs.
Goose	47	Bearded	3	113	None	Aug. 24	36	10	62½
Herisson Bearded	44	do	2	107	do	do 18	32	40	62
Rio Grande	47	do	4½	110	do	do 21	31	40	61
Pringle's Champlain	40	do	3½	107	Little	do 18	31	30	60
Gehun	34	Bald	2½	107	None	do 18	30	30	62
Preston	38	Bearded	3½	103	do	do 14	30	..	59
Red Fife	41	Bald	4	110	do	do 21	29	20	60
Old Red River	44	do	4	110	do	do 21	28	50	60
White Russian	47	do	4	110	do	do 21	27	50	59
Hueston's	41	do	4½	110	do	do 21	27	40	58
White Fife	39	do	4½	110	do	do 21	27	40	60
Albert	42	Bearded	3	103	do	do 14	27	30	55
Green Mountain	39	Bald	3½	107	do	do 18	27	10	59
Azima, Russian	41	Bearded	3½	113	do	do 24	27	..	60½
White Connell	39	Bald	4	110	do	do 21	26	50	60
Great Western	47	Bearded	4	111	do	do 22	25	50	60
Red Fern	43	do	4	103	Little	do 14	25	50	59
Emporium	47	do	4½	107	do	do 18	25	40	60
Hungarian Mountain	38	Bald	3	107	None	do 18	25	30	58
Golden Drop	42	do	2½	105	do	do 16	24	50	61
Stanley	37	do	4	103	do	do 14	24	40	59
Ladoga	45	Bearded	3	103	do	do 14	24	..	57
Wellman's Fife	44	Bald	4½	110	do	do 21	23	50	58
Colorado	41	Bearded	3	101	do	do 12	23	20	60
Campbell's Triumph	41	Bald	3	101	do	do 12	23	..	57
Crown	42	Bearded	3½	110	do	do 21	22	10	60
Alpha	45	Bald	4	109	do	do 20	22	..	59
Stonewall	42	Bearded	3	101	do	do 12	22	..	57
Prince	40	do	2¾	103	do	do 14	21	20	56
Manifold	42	do	3	103	do	do 14	21	..	56
A. No. 1	42	do	3	105	Little	do 16	20	30	57
Campbell's White Chaff	41	Bald	4	104	do	do 15	19	40	57
Trial	42	Bearded	3	104	None	do 15	19	..	57
Black Sea	42	do	3	104	do	do 15	18	10	57
Abundance	42	do	4	107	Little	do 18	17	50	56
Ottawa	40	do	3	104	do	do 15	17	40	56
Beta	41	do	3	104	do	do 15	16	50	56½
Carleton	43	do	3	104	None	do 15	16	40	56
Anglo-Canadian	37	do	4½	123	Badly	Sept. 3	7	..	32

NOTE.—The weights per bushel given here, and also with all other grain tables in my report, are not the maximum weights that the grain could be brought to, but were taken from grain cleaned to a condition fit for milling purposes only.

Cross-bred Wheats.

The parentage of the cross-bred varieties referred to in the table is as follows:—

(Bearded)	Carleton......	Ladoga	female and White	Fife	male......
(Bald)	Stanley........	do	Red	do	......
(Bearded)	Preston.......	do	do	do	....
do	Prince.........	do	White	do	....
do	Abundance...	do	Red	do	....
do	Ottawa........	do	do	do	....
do	Albert.........	do	do	do	....
(Bald)	Alpha.........	do	White	do	......
(Bearded)	Crown........	do	do	do	......
do	Stonewall....	do	Red	do	....
do	Manifold.....	do	White	do	......
do	A No. 1.......	do	Red	do	....
do	Trial..........	do	do	do	......
do	Beta...........	do	do	do	....

Summary of tests of varieties continued over a number of years.

The conditions surrounding even the best conducted field experiments are so variable that any one year's experience should not be considered final and only by repeated tests continued through a number of years can we hope to reach correct conclusions.

A number of the leading varieties of grain have now been tested on this farm for several years and a short summary is submitted of the results obtained.

The greater portion of these varieties have been grown during four greatly varying seasons and the average results may be considered fairly reliable.

In the accompanying table it will be noticed that Blue Stem, a variety grown quite extensively in the North-western States, has given a large average yield, but we find that it matures on an average 4 days later than Red Fife, a great objection here.

White Connell gives a slightly larger return than Red Fife, and White Fife somewhat less than Red.

The yield from Ladoga averages nearly 9 bushels per acre less than Red Fife, but Ladoga matures on an average eight days earlier.

Hungarian Mountain is a hard variety that promises well and I think deserves some attention.

Campbell's White Chaff is an early ripening variety, but soft in the berry and not nearly as productive here as the Fifes.

TABLES showing the average wheat yields for four years, with average weight per bushel, and days taken to mature.

Variety.	Years included.	Average yield per acre.		Average days maturing.	Average weight per bushel.
		Bush.	lbs.		
Blue Stem	1890-91-92	34	42	134	57
Pringle's Champlain	1890-91-92-93	33	18	125	58½
White Connell	1890-91-92-93	32	8	128	59
Rio Grande	1890-91-93	32	2	129	60
Hungarian Mountain	1890-92-93	31	57	125	60
Red Fife	1890-91-92-93	31	56	130	57½
Defiance	1890-91-92	31	4	133	58
French Imperial	1890-91-92	30	32	128	62
White Fife	1890-91-92-93	30	23	128	58
Club	1890-92-93	29	19	120	61
Green Mountain	1890-92-93	28	34	121	60½
Red Fern	1890-91-92-93	28	33	125	59
White Russian	1892-93	28	10	....	58½
Emporium	1892-93	27	40	....	59
Colorado	1890-91-92-93	27	6	122	57
Wellman's Fife	1890-92-93	26	58	126	60
Old Red River	1890-92 93	26	6	124	60½
Gehun	1891-92-93	25	50	119	60
Campbell's White Chaff	1890-92-93	24	49	123	59½
Golden Drop	1890-92-93	23	2	123	61
Ladoga	1890-91-92-93	23	..	122	56
Campbell's Triumph	1890 92-93	22	36	120	59
Hard Red Calcutta	1890-92	18	42	120	61

EARLY MEDIUM AND LATE SOWN WHEAT.

These experiments which proved so interesting in 1892 have been repeated this year, and the season being different, the results are not quite the same. With one exception the wheat plots yielded in the order they were sown, the first sown giving the best return and decreasing each week after. They also ripened in the exact order of sowing, again emphasizing the fact that to escape fall frosts, wheat should be sown as early as possible. Red Fife again gave the largest yield, and ripened as early as the Campbell's White Chaff, the rust on the latter variety appearing to delay its ripening, soil, black loam $\frac{1}{10}$ acre, sown with common drill, 1½ bushels per acre, summer fallow.

When Sown.	Variety.	Length of Straw.	Length of Head.	Rust.	No. of days maturing.	Ripe.	Yield per Acre.		Lbs. per Bush.
		Inches.	Inches.				Bush.	lbs.	Lbs.
May 2	Red Fife	43	4	None	108	Aug. 18	28	10	59
do 9	do	43	3½	do	104	do 21	33	20	60
do 16	do	43	3½	do	100	do 24	28	50	60
do 23	do	43	3½	do	101	Sept. 1	26	40	56
do 30	do	34	3½	Little	96	do 3	22	10	61
June 6	do	35	3	do	98	do 12	18	50	59
May 2	Campbell's White Chaff	42	3	do	108	Aug. 18	23	30	60
do 9	do do	46	3½	do	104	do 21	23	..	57½
do 16	do do	38	3½	do	104	do 28	17	..	57
do 23	do do	36	3	do	101	Sept. 1	15	..	57
do 30	do do	30	3½	Badly	96	do 3	15	..	57
June 6	do do	34	2¾	Very bad	95	do 9	12	30	59

EARLY, MEDIUM AND LATE SOWN OATS.

With oats the Banner plots yielded in the order of sowing, but the returns from the Prize Cluster were irregular; the last named variety is more readily affected by drought, the absence of rain even for a short time lessens the yield. The Banner oat has again proved the most productive, but ripened, on an average, 6 days later than the Prize Cluster, soil, black loam, sown with drill, 10 pecks per acre, plots $\frac{1}{10}$ acre, summer fallow.

When Sown.	Variety.	Length of Straw.	Length of Head.	Rust.	No. of days maturing.	Ripe.	Yield per Acre.		Lbs. per Bush.
		Inches.	Inches.				Bush.	lbs.	Lbs.
May 2..	Prize Cluster..	41	8	None.....	94	Aug. 4..	61	26	40
do 9..	do	40	9½	do	90	do 7..	69	24	40
do 16..	do	42	9	do	87	do 11..	64	24	40½
do 23..	do	44	8	Little	86	do 17..	48	28	34
do 30..	do	40	9	Badly	85	do 23..	52	12	40
June 6..	do	39	9	do	80	do 25..	50	30	38
May 2..	Banner	42	7	None....	101	do 11..	86	16	33
do 9..	do	41	7	Little	98	do 15..	75	10	33
do 16..	do	40	7½	do	94	do 18..	69	4	34
do 23..	do	46	8	do	91	do 22..	61	26	34
do 30..	do	46	9	do	91	do 29 .	57	12	32
June 6..	do	44	7	do ...	87	Sept. 1..	52	32	32

EARLY, MEDIUM AND LATE SOWN BARLEY.

Baxter's six-rowed with a single exception yielded in the order sown, ranging from 40 bushels for the first sown plot, to 34 bushels for the last. Two-rowed Duckbill like the Prize Cluster oat, and apparently from the same cause, gave a very irregular yield.

Sown with common drill, 2 bushels per acre, soil strong loam, summer-fallowed, size of plot, one-tenth acre.

When Sown.	Variety.	Length of Straw.	Length of Head.	Rust.	No. of days maturing.	Ripe.	Yield per Acre.		Lbs. per Bush.
		Inches.	Inches.				Bush.	lbs.	Lbs.
May 2..	Baxter's Six Rowed......	37	3	None	97	Aug. 7..	40	40	49
do 9..	do	34	2½	do	90	do 7..	28	16	49½
do 16..	do	37	2¼	do	88	do 12..	36	12	48
do 23..	do	37	2	do	81	do 12..	35	40	46
do 30..	do	34	2½	do	77	do 15..	35	..	45
June 6..	do	32	2½	do	73	do 18..	34	18	42
May 2..	Duckbill Two Rowed....	37	3½	do	102	do 12..	43	46	49
do 9..	do	34	3½	do	95	do 12..	42	34	47
do 16..	do	31	3½	do	93	do 17..	47	24	50
do 23..	do	29	3	do	87	do 22..	45	40	48
do 30..	do	33	3¼	do	90	do 28..	42	4	47
June 6..	do	31	3	do ...	87	Sept. 1..	36	32	48

THE CUTTING OF WHEAT AT DIFFERENT STAGES OF RIPENESS.

Two years ago a series of experiments were commenced to determine the proper stage at which wheat should be cut; at that time fall frost seriously interfered with the completeness of the experiment. The past season was a more favourable one and the result quite clear.

When the season is backward and fall frosts threaten, the temptation to harvest wheat before it is fully matured is great, but it is evident from the following table that considerable loss results both in quantity and weight of sample if the grain has not at least reached what is generally called the dough stage.

In this experiment both red and white varieties of wheat were used, and the result with each is practically the same.

The plots were one-tenth acre; soil black loam, summer-fallowed previous year, sown with common drill on 5th May, 1½ bushels per acre.

Variety.	Stage when cut.	No. days from sowing.	Date of cutting.	Yield per acre.	Weight per bush.
				Bush. lbs.	Lbs.
Red Fife, 1st cut..........	Early milk stage......	94	August 7	16 20	45½
do do 2nd do..........	Late do	97	do 10	24 10	54½
do do 3rd do.	Dough stage	101	do 14	28 20	58
do do 4th do....... ..	Ripe yellow....	108	do 21	28 40	60
White Connell 1st cut.....	Early milk stage......	94	do 7	15 40	48
do do 2nd do. ...	Late do	97	do 10	20 20	53
do do 3rd do......	Dough stage.	101	do 14	28	58
do do 4th do.....	Ripe yellow...........	108	do 21	29	60

The accompanying view is from a photograph taken during wheat harvest at the Brandon Farm.

HARVESTING WHEAT, EXPERIMENTAL FARM, BRANDON, MAN.

HOME GROWN, AGAINST CHANGED SEED.

Red Fife was procured from the North-west Territories and sown alongside of Red Fife grown on the Experimental Farm, the result is slightly in favour of the home grown seed, but the experiment will have to be repeated several times before a safe conclusion can be reached.

Sown on black loam soil 5th May with a common drill, 1½ bushels per acre, land summer-fallowed the previous year, size of plots one-tenth acre.

Variety.	——	Length of straw.	Length of head.	No. days maturing.	Ripe.	Yield per acre.		Weight per bush.
						Bush.	lbs.	Lbs.
Red Fife..........	Home grown	42 inches.	4 inches..	111	Aug. 24	29	50	57
do	Changed seed....	42 do .	4 do ..	111	do 24	27	50	58

CULTIVATION OF FALL PLOUGHED LAND.

With the object of retaining moisture it is generally considered advisable to harrow and roll land after ploughing in the fall. To ascertain whether this method is beneficial or not four adjoining plots were selected, one received a fall ploughing only, the others were also worked more or less with harrow and roller.

It will be seen by the accompanying table that the plot simply fall ploughed, gave the largest return, and was the freest from weeds.

The absence of weeds can be explained by the more thorough work of the harrow in spring on the rough furrows of this plot. For a comparison a summer-fallowed plot adjoining was sown the same time, this gave three bushels per acre more than the best of the fall ploughed plots, and nearly five bushels more than the average of them.

Soil black loam, summer-fallowed, sown with press drill on the 2nd May, 1½ bushels seed per acre, bluestoned, no smut or rust, size of plots one-tenth of an acre.

Variety.	How treated.	Weeds.	Length of Straw.	No. days maturing.	Ripe.	Yield per acre.		Weight per bushel.
			Inches.			Bush.	Lbs.	Lbs.
Red Fife. ..	Summer fallowed......	None	43	109	Aug. 19..	26	20	59
do	Fall ploughed only..........	do	37	104	do 14..	23	20	59
do	Fall ploughed and harrowed twice................	Few.........	35	104	do 14..	22	40	60
do	Fall ploughed and rolled twice.	Weedy...... ..	38	103	do 13..	21	30	58
do	Fall ploughed, harrowed and rolled.	Very weedy ..	32½	103	do 13..	19	10	60

THE USE OF BARN-YARD MANURE AS A FERTILIZER.

Last year a few tests were made with barn-yard manure as a fertilizer for wheat, to ascertain whether the effect of the manure was lasting or not; these plots were sown again this year with wheat; very little increase is shown from the manure applied in 1892, but the unrotted gives slightly the best return.

Upland prairie, light loam, sown 12th May with press drill, 1½ bush. per acre, one-tenth acre plots, 20 tons per acre of each kind of manure applied in spring of 1892.

Variety.	—	Length of straw.	No. days maturing.	Ripe.	Yield per acre.		Lbs. per bushel.
		Inches.			Bush.	lbs.	
Red Fife..	Unrotted manure.........	36	93	Aug. 13....	15	10	56
do	Rotted manure...........	38	93	do 13....	13	50	56
do	No manure...............	36	96	do 16....	13	30	55

Besides the plots included in the preceding table, eight additional ones on clay loam were this year treated with manure which was applied both on the surface and ploughed in. It will be seen that manure applied on the surface has generally given the best return, it no doubt acted as a mulch and retained the moisture during the drought. Fall ploughing appears to encourage weed growth, and this agrees with our experience every year. Soil clay loam, Red Fife, sown 2nd May with press drill, 1½ bushels per acre, plots, one-tenth acre, wheat stubble land.

When ploughed.	Kind of manure.	How manure was applied.	Weeds.	Length of straw.	No. days maturing.	Ripe.	Yield per acre.		Weight per bushel.
				Inches.			Bush.	lbs.	Lbs.
Spring....	None.. ..	....	No weeds...	42	104	Aug. 14..	22	40	59
Fall......	Unrotted...	On the surface...	Weedy......	35	104	do 14..	22	20	60
Spring....	do ...	do ..	Few weeds..	38	104	do 14..	22	10	59
do	Rotted.....	do ..	do ..	35	104	do 14..	21	..	60
do	do	Ploughed in.....	do ..	37	102	do 12..	19	20	60
Fall......	do	On the surface...	Very weedy.	31	103	do 13..	19	10	60
do	None.......	....	do ..	36	103	do 13..	17	..	59
do	Rotted......	Ploughed in.....	do ..	33	103	do 13..	17	..	59

TEST OF DRILLS.

The difference each year between the returns from drilling and broad-casting have been so great on this farm, that the importance of this question should be kept constantly before the farming public.

In addition to a report of this year's tests of drilling and broadcasting wheat, a summary of four years' tests is also given; it will be seen that the average difference in favour of drills is over 5 bush. per acre with wheat, and 11 bush. with barley. It is estimated that there are one million acres devoted to wheat in this province, and if only 25 per cent of this is sown broadcast and the results reached on this farm fairly represent the whole province it represents a loss of over one million bushels a year.

We find that in addition to the increased yield obtained by sowing with a drill, the grain also ripens more evenly and stands up better.

TEST OF DRILLS FOR SOWING WHEAT.

Wheat stubble ploughed in spring, soil rich black loam, Red Fife wheat, sown 3rd May, size of plots one-fifth acre.

——	Pecks per acre.	Length of Straw.	No. days maturing.	Ripe.	Yield per Acre.		Weight per Bushel.
		Inches.			Bush.	lbs.	Lbs.
Press Drill, wheel coverers, 3½ inches.....	6	41	103	Aug. 14..	29	35	60
Broad-cast Machine, and ploughed in......	8	41	110	do 21..	27	35	60½
Press Drill, wheel coverers, 7 inches........	6	44	104	do 15..	25	55	60
Common Drill...........................	7	41	108	do 19..	23	50	60
Press Drill, chain coverers.................	6	41	108	do 19 .	18	30	60
Broadcast Machine......	8	40	111	do 22..	17	15	60

FOUR YEARS' TEST OF DRILLS IN SOWING WHEAT.

Kind of Drill.	Years included.	Average Yield per Acre.		Average Days Maturing.
		Bush.	lbs.	
Common Drill...................................	1890-91-92-93..	30	44	128
Press do	1890-91-92-93...........	30	29	128
Broadcast Machine................................	1890.91-92-93...........	25	18–	130

THREE YEARS' TEST OF DRILLS IN SOWING BARLEY.

Press Drill....................................	1890-91-92..............	57	45	112
Common Drill..................................	1890-91-92............ .	53	44	112
Broadcast Machine..............................	1890-91-92..............	46	37	112

TEST OF BLUESTONE AS A SMUT PREVENTIVE.

The use of bluestone as a smut preventive is increasing very rapidly in this province. Merchants who a few years ago were unable to sell a hundred pounds in a season, now import it by the ton, and the almost total absence of smut this year is evidence that this fungus is being rapidly brought under control.

The results of this season's experiments with bluestone were practically the same as last, the untreated giving about 30 times as many smutty heads as the treated, the treated also gave from 6 to 7½ additional bushels per acre.

Land summer-fallowed, size of plots, one-tenth of an acre, six pecks per acre, bluestone liquid sprinkled on the seed, results obtained by counting the wheat

heads on ten feet square. Common drill used, soil clay loam, sown 10th May, cut 24th August.

Variety.	How treated.	Yield per Acre.		Weight per Bush.	Smutty Heads.	Heads with no Smut.
		Bush.	lbs.	Lbs.		
Very smutty Red Fife........	1 lb. bluestone to 5 bushels..	27	30	58	10	1,980
do	1 do 10 do ..	25	50	58	12	1,572
do	No bluestone.............	20	00	55	306	1,956

VARIETIES OF OATS.

Forty-five varieties of oats have been tested on the Experimental Farm this year, and although the season has been unfavourable the yield was large and the weight per bushel fair.

It is customary in this country to sow oats on land unfit for wheat, and for that reason the grain throughout the central and western portions of the province suffered very severely from the unfavourable weather during August.

On the Experimental Farm, nearly all the oats were sown on summer-fallow and the drought and hot winds have had very little effect on the yield, but the straw was shorter than usual, but stiff and free from rust.

That excellent variety the Banner oat has again made a good record for itself, yielding 91 bushels per acre. Although this variety has been introduced for a number of years, it is still one of the best oats we have, being productive, with a kernel of medium weight, white in colour, and apparently thin hulled.

The following varieties have been tested this year for the first time.

Wide Awake,—a white branching oat, productive, but rather light in weight for a white oat, this variety yielded 68 bushels per acre, the best return from the new varieties of the year.

Imported Irish,—white, with a branching head medium early, the straw of this variety was quite rank for the season, and free of rust.

Cave,—a rather short strawed white oat, with a very handsome branching head, yield 65 bushels: this variety was badly beaten out by wind, otherwise it would have made a better return.

Golden Beauty,—a late ripening white oat, with long straw and kernel: this variety is the lightest weighing oat of the season.

White Wonder,—a very early ripening variety, maturing in 93 days, and like all oats of its class, it weighs well. Oderbruch, a promising side oat, but rather light in weight. Scottish Chief and Canadian Beauty are both early, white oats with branching heads, the last named ripens with the Welcome, but does not equal that variety in productiveness. The Columbus has proved both unproductive and light in weight, and its yellow colour is against it.

TEST OF FORTY-FIVE VARIETIES OF OATS.

Sown on 6th May in valley on clay loam soil, summer-fallowed, sown with common drill, 9 pecks of seed per acre, size of plots, one-tenth of an acre.

Variety.	Length of straw.	Kind of straw.	Length of head.	No. of days maturing.	Ripe.	Yield per acre.		Weight per bushel.
	Inch.		Inch.			Bush.	lbs.	Lbs.
Banner	41	Branching	9	98	Aug. 12	91	6	35
Abundance	40	do	8	98	do 12	85	..	35
Rosedale	43	Half sided	7	97	do 11	82	22	35½
American Beauty	42	Branching	8	100	do 14	82	2	35
Victoria Prize	40	do	7	96	do 10	79	4	42
White Russian	43	do	8	97	do 11	77	2	38
Early Gothland	42	Sided	7	96	do 10	76	16	35½
Welcome	41	Branching	7	90	do 4	76	6	41
English White	38	do	10	95	do 9	75	20	34
Challenge White	45	do	7	96	do 10	75	..	40
Improved Ligowo	38	do	7	96	do 10	75	..	38½
Archangel	46	do	9	96	do 10	75	..	40½
Prize Cluster	41	do	8	90	do 4	74	4	41½
Cream Egyptian	45	do	11	96	do 10	72	2	40½
Bonanza	43	do	8	90	do 4	71	26	40
Winter Gray	47	do	10	90	do 4	71	6	41
Abyssinia	45	Sided	7	100	do 14	69	14	37
Wide Awake	41	Branching	8	100	do 14	68	8	37
White Dutch	40	do	11	93	do 7	67	22	38
Imported Irish	44	do	7½	96	do 10	66	17	37
Imported Blk. Tartarian	47	Sided	8	100	do 14	66	16	35
Rennie's Prize White	46	Branching	10	94	do 8	66	16	40
Early Blossom	43	Half sided	8	103	do 17	66	6	35
Early Etampes	35	Branching	6½	100	do 14	66	6	34
Cave	39	do	8	101	do 15	65	10	36
Holstein Prolific	44	do	7	100	do 14	65	10	32
Golden Beauty	42	do	8	102	do 16	64	24	31
Joanette	31	do	6	98	do 12	64	24	34
Black Tartarian Prolific	38	Sided	7	100	do 14	64	24	33
Black Coulommiers	41	Branching	8	......	do —	64	24	35
Hazlett's Seizure	46	do	13	96	do 10	63	8	39½
Flying Scotchman	37	do	7	90	do 4	62	32	35
Royal Doncaster	29	do	7	96	do 10	59	24	35
White Wonder	43	do	11	93	do 7	59	4	41
California Prolific	46	Sided	8	100	do 14	58	18	31
Poland White	37	Branching	9	96	do 10	57	22	38½
Oderbruch	40	Sided	8	100	do 14	56	6	35
Giant Cluster	35	do	8	100	do 14	54	14	28
Scottish Chief	42	Branching	8	93	do 7	54	14	40
Canadian Beauty	39	do	9	90	do 4	53	28	40½
White Hungarian	38	Sided	7½	104	do 18	53	18	33
American Triumph	47	Branching	9	102	do 16	53	8	32½
Siberian	43	Sided	8	102	do 16	51	16	36
Swedish	36	do	7	104	do 18	47	2	31
Columbus	42	Branching	7	100	do 14	31	6	34

AVERAGE RESULTS FROM FOUR YEARS' TESTS WITH VARIETIES OF OATS.

In addition to tables giving the past season's tests with oats, the average results with several of the leading varieties for the past three or four years are given.

In this table also the Banner takes the lead for productiveness, with the high average of 82 bush., closely followed by English White and Rosedale.

Winter Gray and Prize Cluster are the two earliest varieties, but they are behind in productiveness, Winter Gray also gives the highest average weight per bushel.

It is evident from the returns, which cover several seasons of varying temperature and rainfall, that some of these varieties may be safely regarded as less desirable than others for this province.

Variety.	Years included.	Average Yield per Acre.		Average days maturing.	Average weight per bushel.
		Bush.	lbs.		Lbs.
Banner	1890-91-92-93	82	8	112	35
English White	1890-91-92-93	78	13	109	34
Rosedale	1890-92-93	74	5	109	37
White Russian	1890-91-92-93	74	3	112	36
Welcome	1890-91-92-93	73	18	106	38
Australian	1890-91-92	72	19	121	34
Early Blossom	1890-91-92-93	72	5	112	36
Archangel	1890-91-92-93	71	28	107	39
Black Champion	1890-91-92	71	14	120	35
Black Tartarian	1890-91-92-93	70	19	114	34
Glenrothern	1890-91-92	70	8	123	35
Holstein Prolific	1890-91-92-93	69	16	117	34
Winter Gray	1890-91-92-93	67	12	105	40
Prize Cluster	1890-91-92-93	64	19	105	37
American Triumph	1890-91-92-93	64	10	118	33
Early Race Horse	1890-91-92	62	5	112	39
Rennie's Prize White	1890-92-93	61	22	104	39

VARIETIES OF BARLEY.

Although barley in common with other cereals suffered from the excessive heat and drought of August the returns from this year's crop are nevertheless good, and when taken in connection with the results of the feeding tests it will be seen that this can be made one of the most profitable crops grown in the province.

Barley has two strong points in its favour; it is seldom injured by fall frosts, it can be sown after wheat in spring, and harvested before that staple crop is ripe, by this means profitably utilizing the spare time between wheat seeding and harvest.

We have found that crushed barley is an excellent food for horses, cattle, swine and poultry.

TESTS OF VARIETIES OF BARLEY.

Sown 16th May with a common drill, 8 pecks per acre, on clay loam soil, summer-fallowed, size of plots $\frac{1}{10}$ acre.

Variety.	Length of straw.	Kind of head.	Length of head.	Number of days maturing.	Ripe.	Yield per acre.		Lbs. per bush.
	Inch.		Inch.			Bush.	lbs.	
Odessa	37½	6 row	2½	85	Aug. 9	57	4	48
Mensury	40	6 do	3½	86	do 10	54	18	47
Sharpe's Improved Chevalier	36	2 do	3	90	do 14	53	6	48
Kinver Chevalier	39	2 do	3	90	do 14	51	2	47
Golden Grains	36	2 do	4½	90	do 14	48	46	48
Duckbill	36	2 do	3½	86	do 10	48	26	48
Goldthorpe	36	2 do	3	92	do 16	48	16	45
French Chevalier	36	2 do	4	90	do 14	47	44	48
Baxters	35	6 do	2	80	do 4	46	42	47
Danish Chevalier	33	2 do	4	90	do 14	45	30	45½
Oderbruch	36	6 do	2½	86	do 10	45	10	48
Canadian Thorpe	36	2 do	2½	90	do 14	44	38	45
Rennie's Improved	33	6 do	2½	80	do 4	43	16	47
Common Six-rowed	32	6 do	2½	83	do 7	43	6	49½
Prize Prolific	33	2 do	4½	90	do 14	42	14	47
Thanet	41	2 do	5	90	do 14	40	10	45
Petschora	31	6 do	3½	83	do 7	39	28	42
Guymalaye	37	6 do	3	85	do 9	31	2	55

RESULTS OF TESTS WITH BARLEY FROM 1890 TO 1893.

In the following table will be found a summary of the results obtained with some of the principal varieties of barley, during the past four years; the Duckbill, Goldthorpe and Odessa are the three most productive varieties, these are also stiff strawed sorts, an important consideration in this country where the rich soil encourages a rank and tender growth of straw.

Variety.	Years included.	Average yield per acre.		Average days maturing.	Average weight per bushel.
		Bush.	lbs.		Lbs.
Duckbill Two-rowed	1890, '91, '92, '93	59	28	102	50½
Goldthorpe do	1890, '91, '92, '93	59	21	109	49½
Odessa Six-rowed	1890, '91, '92, '93	59	10	97	51
Prize Prolific Two-rowed	1890, '91, '92, '93	55	16	105	50
Sharpe's Improved Chevalier Two-rowed	1892, '93	54	38	94	49½
Danish Chevalier do	1890, '91, '92, '93	54	11	104	50½
California Prolific do	1891, '92	53	46	105	50½
Kinver Chevalier do	1891, '92, '93	52	22	103	50
Rennie's Six-rowed	1890, '91, '92, '93	51	31	94	50
Beardless Two-rowed	1890, '91, '92	50	27	110	51
Mensury Six-rowed	1892, '93	47	34	89	47½
Thanet Two-rowed	1890, '92, '93	44	32	101	50
Baxter's Six-rowed	1890, '92, '93	41	7	88	49

PEASE.

Twelve varieties of pease have been tested on the farm this year, the season was favourable, and nearly all the varieties have given a good return.

This crop if grown on clean land has always given profitable returns here, the only objection to its increased cultivation is the difficulty found in harvesting and threshing it. To ascertain whether this could be lessened a trial was made of growing it with other grain, and using a binder to cut, and a separator to thresh the combined crop. Grown with other grain, both stood up well, and were readily cut with a binder, and we found no difficulty in threshing it with a separator, but the accompanying table will show that the return of pease from this method was small.

It is said that pea harvesters are in use in eastern Canada, but they have not been introduced here.

TEST OF VARIETIES OF PEASE.

Sown May 5th on summer fallow, with a common drill; soil-clay loam; size of plots one-tenth acre.

Variety.	Amount sown per acre.	Apparent thickness.	Length of straw.	Length of pod.	Number of days maturing.	Ripe.	Yield per acre.		Weight per bushel.
	Bush.		Inch.	Inch.			Bush.	lbs.	Lbs.
Golden Vine	2½	Right	41	2	101	Aug. 14	36	20	65
Prince Albert	2½	Thin	50	3	108	do 21	32	40	64½
Multiplier	2½	do	49	2½	114	do 27	31	50	63
Crown	2½	Right	34	2	99	do 12	31	50	64
Mummy	3	do	38	3	110	do 23	30	50	64
Prussian Blue	2½	do	41	2¾	108	do 21	29	50	63
Potter	2½	Very thin.	38	3	115	do 28	29	00	62
Pride	3	Thin	38	3	96	do 9	28	30	63
White Marrowfat	3½	do	35	3½	115	do 28	27	00	64
Black Eyed Marrowfat	3½	do	44	3	111	do 24	26	30	62
Canadian Beauty	3⅓	do	49	3	116	do 29	25	50	62
Centennial	3	do	48	3	115	do 28	18	40	63½

MIXED CROPS GROWN FOR GRAIN.

Variety.	Pecks per acre sown.	Date of sowing.	How sown.	Lbs. per bushel.	Yield of mixed grain per acre.		Proportion of pease per acre.	
					Bush.	lbs.	Bush.	lbs.
Pease—Crown Oats—Prize Cluster	8 4	May 5 do 5	Press drill do	31	56	14	4	40
Pease—Crown Wheat—Red Fern	8 4	do 5 do 5	Press drill do	60	27	..	3	40
Pease—Crown Barley—Prize Prolific	8 4	do 5 do 5	Press drill do	50	49	30	3	40
Pease—Crown Oats—Holstein Prolific	4 8	do 16 do 16	Press drill, north & south do east and west.	31	64	19	2	30
Pease—Crown Oats—Holstein Prolific	4 8	do 16 do 16	Press drill, 3½ inches do do	31	61	29	1	10
Pease—Golden Vine Oats—Banner Wheat—Red Fife	4 4 4	do 16 do 16 do 16	Common drill do do	31	46	4	1	10

THICK AND THIN SOWING OF PEASE.

The quantity of seed per acre generally sown here has been regulated by eastern experience, and has always appeared too little for this province.

To test this matter, three plots of Prince Albert peas, a variety of medium size, were sown with different quantities of seed, and the results seem to show that a liberal seeding is the most profitable.

Soil, black loam, plots one-tenth acre, sown with common drill on summer-fallow.

Variety.	When sown.	Amount sown per Acre	Apparent Thickness.	Length of Straw.	Length of Pod.	No. Days maturing.	Ripe.	Yield per Acre.		Weight per Bush.
		Bush.		Inches.	Inches.			Bush.	lbs.	Lbs.
Prince Albert.........	May 5..	2	Thin ...	50	3	111	Aug. 24.	22	30	64
do	do 5..	3	Right ..	50	3	109	do 22.	27	30	64
do	do 5..	4	Thick ..	50	3	108	do 21.	26	20	64

ROTATION OF CROPS.

At present very few farmers in this country, practice a rotation of crops, many following wheat with wheat until the land is so impoverished or made foul with weeds, that less than half a crop is obtained.

As this system, or rather want of system, will have to be changed before many years, some experiments were undertaken this year for the purpose of throwing light on the proper rotation for this country.

It will be seen that both fodder corn and millet stubble, gave better returns than summer-fallow, this, however, is the result of only one year's test.

Variety sown.	How prepared.	Character of Soil.	When sown.	Length of Straw.	Length of Head.	When cut.	Days Maturing.	Yield per Acre.		Lbs. per Bush.
				In.	In.			Bush.	lbs.	
Red Fife, Barley stubble	Spring ploughed ...	Loam	May 3.	39	4	Aug. 19	108	17	05	59
do summer-fallow.	No spring preparat'n	do	do 3.	40	4	do 20	109	24	35	58
Red Fife, Millet stubble	Spring ploughed	Loam	May 2.	36	4	Aug. 19	109	28	20	59
do summer-fallow.	No spring preparat'n.	do	do 2.	43	4	do 19	109	26	20	59
Red Fife, Fodder Corn stubble	Spring ploughed	Clay loam	May 17.	38	3½	Aug. 21	97	35	30	61
do summer-fallow.	No spring preparat'n.	do ..	do 17.	41	4	do 21	97	31	30	60
Red Fife, Pea stubble...	Spring ploughed	Light loam	May 12.	34	3½	Aug. 13	93	14	40	54
do do	Unploughed........	do ..	do 12.	32	3½	do 13	93	13	10	54
do summer-fallow.	No spring preparat'n.	do ..	do 12.	36	3½	do 15	95	15	00	55
Red Fife, Oat stubble...	Spring ploughed	Light loam	May 12.	34	3½	Aug. 13	93	13	20	55
do summer-fallow.	No spring preparat'n.	do ..	do 12.	36	3½	do 15	95	15	00	55

LOSSES FROM SOWING INJURED SEED GRAIN.

Complaints are being received from all parts of the province regarding the lack of germinating power in the grain sown last spring, some farmers losing their whole crop from this cause.

The grain of this province if properly stacked and garnered will always show a high germinating power; and the losses this year can generally be traced to the use of damp wheat for seed, the grain garnered in a damp condition may be apparently sound, but experience has proved that grain ever so slightly heated, is unsafe to sow and should be tested before sowing, and if this cannot be done, it should be discarded, and only perfectly sound seed used.

Where doubts exist regarding the germination of seed grain, a sample should be forwarded by mail to the Central Experimental Farm, Ottawa, where it will be tested and the returns sent back, free of charge.

All seed grain intended for distribution from this farm is tested for germinating power before being sent out.

The following tables give the number of samples tested, and the average germinating power of each kind of grain grown on the Experimental Farm in 1892. These were tested at the Central Experimental Farm.

Wheat, 49 samples tested: average germinating power, 91 per cent; strong plants, 84 per cent; weak plants, 7 per cent.

Oats, 41 samples tested: average germinating power, 97 per cent; strong plants, 86 per cent; weak plants, 11 per cent.

Barley, 34 samples tested: average germinating power, 90 per cent; strong plants, 75 per cent; weak plants, 15 per cent.

Couch Grass Extermination.

Numerous letters of inquiry are received each year regarding the best plan for destroying Couch or Quack Grass.

The above terms are applied indiscriminately here to two quite distinct grasses, both of them different from the couch grass of the east, *Agropyrum repens*. One variety, *Agropyrum glaucum* or Colorado Blue Stem, Fig. 2, has a bright bluish-green narrow blade, and ripens its seed in July, the other *Hierochloa borealis*, Holy Grass or Sweet Grass, Fig. 3, has a wide, light green blade, and ripens its seed in May; the last mentioned is the more common, and is fast getting possession of some farms, and completly chokes out any grain that may be sown with it. Both varieties are readily propagated from both seed and root stocks.

Fig. 2.—COLORADO BLUE-STEM. (*Agropyrum glaucum*, *R. & S.* var. *occidentale*, V. & S.)

Fig. 3.—*Hierochloa borealis*, R. & S.

The sweet grass ripening early, generally sheds its seed before summer-fallows are ploughed and the one ploughing usually given summer-fallow here covers this seed, and spreads the root stocks over the field, the smallest piece of which will grow and become a centre of distribution another year.

Last spring four one-tenth acre plots badly infested with the sweet grass were set apart for experimental work.

All were ploughed May 28th.

Plot 1, was at once sown with three bushels of barley per acre, and the crop allowed to ripen.

Plot 2, also sown, but with oats, and the crop allowed to ripen.

Plot 3, was summer-fallowed by ploughing once and the weeds kept down with surface cultivation.

Plot 4, also summer-fallowed but ploughed twice and couch grass roots brought to the surface by harrowing.

Very little sweet grass is left in Plots 1 and 2, and none whatever can be seen in Plot 4, twice ploughed; but in Plot 3, ploughed but once, the grass appears thicker than ever.

These plots will be kept in view and their condition reported on next year.

FODDER CORN.

This plant has generally given such good returns here that an increased area has been sown every year.

In addition to the fifteen varieties sown in small plots, a field of eleven acres was sown this year for ensilage purposes.

As this plant makes its principal growth late in the season, it suffered severely from the drought and hot winds of August, this reduced the yield to one-half of last year's crop, but the open fall and high temperature was favourable to early maturing and all the varieties formed ears, some of them reaching the roasting stage.

In addition to the usual plan of sowing in rows, a set of duplicate plots were planted in hills; sowing in rows is by far the most expeditious and has this year given the largest return; there was no noticeable difference in point of earliness between the two methods of sowing.

The land for this crop was prepared by ploughing in ten loads of rotted manure in spring, was then well harrowed and the corn sown with a press drill.

This land was in millet the previous year.

FODDER CORN sown on 26th May, with a press drill, in rows three feet apart, and nine inches apart in the row, cut 14th September.

Variety.	When tasseled.	In Silk.	Early Milk.	Late Milk.	Stage when cut.	Height in inches	Leafiness.	No. of Stools.	Weight green cobs per doz.	Yield per acre, green.	
									Lbs.	Tons.	Lbs.
Mastodon Dent	Aug 20	Aug 25	Sept 4	......	Early milk	84	Little	2	7	13	950
Angel of Midnight....	do 1	do 9	Aug 25	Sept 4	Roasting ears ...	62	Fair......	3	7½	11	1,100
Compton's Early	do 1	do 10	do 25	do 4	Late milk.	62	Good.....	3	9	11	1,100
Golden Dew Drop....	do 4	do 20	do 27	do 5	do ..	63	do	4	7½	11	1,100
Great Northern	do 2	do 9	do 26	do 6	Roasting ears	64	do	4	8½	11	1,100
Gold Dollar...........	do 3	do 10	do 24	do 5	do ..	69	Very good	4	10	11	
North Dakota Flint ..	do 1	do 9	do 24	do 4	do ..	59	Good.....	6	8	10	1,450
Thorobred White Flint	do 25	Sept 5	Sept 11	....	Early milk	52	do	4	......	9	1,800
Gold Coin	July 28	Aug 9	Aug 23	Aug 29	Roasting ears	65	do	3	6½	9	700
Early Minnesota	Aug 1	do 5	do 26	Sept 5	do ..	52	do	4	5½	9	700
Pearce's Prolific	do 3	do 9	do 15	Aug 24	do ..	56	Fair.. ...	3	5	8	1,050
Smut Nose Flint	do 4	do 15	do 25	Sept 3	Late milk.	63	Good.....	3	6½	8	1,050
Early Champion	do 1	do 9	do 26	do 5	Roasting ears ..	39	Poor	5	8	6	1,200
Mitchell's Extra Early	July 25	do 1	do 10	Aug 20	Nearly ripe	45	do	3	4	4	1,900
Burpee's First of All..	do 29	do 7	do 25	do 24	Roasting ears	44	do	5	5½	4	800

FODDER CORN planted on 26th May, in hills, three feet apart each way, three grains in a hill, cut 14th September.

Variety.	When tasseled.	In Silk.	Early Milk.	Late Milk.	Stage when cut.	Height in inches	Leafiness.	No. of Stools.	Weight green cobs per doz.	Yield per acre, green.	
									Lbs.	Tons.	lbs.
Mastodon Dent......	Aug 20	Aug 25	Sept 4	......	Early milk	84	Little	2	7	11	1,100
Great Northern......	do 2	do 9	Aug 26	Sept 6	Roasting ears....	64	Good.....	4	8½	10	900
Angel of Midnight....	do 1	do 9	do 25	do 4	do ..	62	Fair......	3	7½	9	1,800
Golden Dew Drop....	do 4	do 20	do 27	do 5	Late milk.	63	Good.....	4	7½	9	700
Compton's Early....	do 1	do 10	do 25	do 4	do ..	62	do	3	9	9	1,500
Thorobred White Flint	do 25	Sept 5	Sept 11	....	Early milk	52	do	4	......	8	1,600
Gold Coin......	July 28	Aug 9	Aug 23	Aug 29	Roasting ears....	65	do	3	6½	8	1,600
Smut Nose Flint.....	Aug 4	do 15	do 25	Sept 3	Late milk.	63	do	3	6½	8	500
Pearce's Prolific......	do 3	do 9	do 15	Aug 24	Roasting ears....	56	Fair......	3	5	7	1,400
Gold Dollar..........	do 3	do 10	do 24	Sept 5	do ..	69	Very good	4	10	7	1,400
North Dakota Flint..	do 1	do 9	do 24	do 4	do ..	59	Good.....	6	8	7	300
Early Minnesota.....	do 1	do 5	do 26	do 5	do ..	52	do	4	5½	7	300
Early Champion.....	do 1	do 9	do 26	do 5	do ..	39	Poor.....	5	8	5	1,000
Mitchell's Extra Early	July 25	do 1	do 10	Aug 20	Nearly ripe	45	do	3	4	4	1,900
Burpee's First of All..	do 29	do 7	do 25	do 24	Roasting ears....	44	do	5	5½	3	160

MIXED GRAIN FOR HAY.

Six plots have been sown with mixed grain for hay, the returns are very variable ranging from under 2 to nearly 4 tons per acre.

Plots 5 and 6 were sown for the purpose of testing cross-sowing pease against sowing them in every other drill.

In plot 5 the oats were sown at the rate of 8 pecks with a seven-inch drill, then the pease were sown at the rate of 4 pecks in the spaces between the oat drills, making alternate drills of oats and pease, 3½ inches apart.

In plot 6 the oats were sown in 7-inch drills, east and west, and then the pease north and south.

It will be seen that the 3½ inch drills gave much the best return.

Soil clay loam, size of plots one-tenth acre, summer-fallowed.

	Variety.	Pecks per Acre Sown.	Date of Sowing.	How Sown.	When Cut	Weight per Acre Dry.	
						Tons.	lbs.
1	Oats, Prize Cluster........	4	May 5...	*Press drill............	Aug. 17...	1	1,850
	Pease, Crown.......	8	" 5...	do			
2	Wheat, Red Fern...............	4	" 5...	Press drill......	" 21...	2	350
	Pease, Crown.................	8	" 5...	do			
3	Barley, Prize Prolific	4	" 5...	Press drill	" 14...	2	1,850
	Pease, Crown.......	8	" 5...	do			
4	Wheat, Red Fife..............	4	" 16...	Common drill	" 17...	2	1,800
	Oats, Banner................ .	4	" 16...	do			
	Pease, Golden Vine.	4	" 16...	do			
5	Oats, Holstein Prolific..	8	" 16...	Press drill, 3½ in	" 17...	3	1,950
	Pease, Crown..................	4	" 16...	do do			
6	Oats, Holstein Prolific........	8	" 16...	Press drill, east and west.	" 17...	2	1,500
	Pease, Crown..................	4	" 16...	do north and south			

* Injured slightly by alkaline soil.

MILLETS.

The hot, dry August of this year was very much against a large yield of millet, but the land selected for this crop was clean and naturally moist and the returns were very fair for the season.

The plots were of 2 sizes, $\frac{1}{10}$ and $\frac{1}{20}$ acre. The $\frac{1}{20}$ acre plots were sown in drills 12 inches apart, and cultivated between the drills with a Planet jr. drill, the $\frac{1}{10}$ acae acre plots were sown in 7 in. drills and not cultivated, it will be noticed that in every case the cultivated drills gave the largest return.

One-twentieth of an acre of hemp was also sown. This reached 6 feet high and gave 1,300 pounds of the dry product per acrè.

Variety.	Size of Plot.	How treated.	Yield per Acre.			
			Green.		Dry.	
			Tons.	lbs.	Tons.	lbs.
Hungarian Grass..	$\frac{1}{20}$ acre	1-foot drills, and cultivated between	3	1,900	2	100
do	$\frac{1}{10}$ "	7-in. drills, not cultivated	3	1,050	2	300
Common Millet	$\frac{1}{20}$ "	1-foot drills, and cultivated between	3	200	2	100
do	$\frac{1}{10}$ "	7-in. drills, not cultivated	2	1,150	1	1,000
German Millet	$\frac{1}{20}$ "	1-foot drills, and cultivated between	3	100	1	1,800
do	$\frac{1}{10}$ "	7-in. drills, not cultivated	3	.....	1	800
American Millet	$\frac{1}{20}$ "	1-foot drills, and cultivated between	3	700	1	1,300
White French Millet	$\frac{1}{20}$ "	do do	3	.....	1	1,400
Hemp	$\frac{1}{20}$ "	do do	2	900	..	1,300

GRASSES.

The plots of native and hardy imported grasses sown in 1890 and 1891 were again cut this year: the yield of all was somewhat smaller than usual, and the timothy sown in 1890 was scarcely worth the cutting. The native grasses sown the same year are however still giving fair yields.

A considerable area was sown to grass seed this year both with and without a grain crop; owing to the dry summer very few of the varieties, native or imported, sown in spring with a grain crop, have grown well; but six acres sown with native grasses alone, have made a good catch, and were from four to six inches high when winter set in.

The plan of sowing grass seed alone on fallowed land late in summer, is, it seems, the most certain for this country, and would be more generally adopted if it were not for the loss of a grain crop which that method entails.

The accompanying table gives the yield and other particulars of the plots of hardy grasses sown during 1890–92; the plots vary in size from one-tenth to one-half an acre each.

Variety.	Size of Plot.	When sown.	When cut.	Yield per acre, dry.	
				Tons.	lbs.
Elymus Americanus	25 × 310 links	Spring 1891	July 18	1	1,870
Muhlenbergia glomerata	60 × 480 do	do 1891	Sept. 1	1	881
Agropyrum tenerum	25 × 480 do	do 1892	July 18	1	400
Austrian Brome	25 × 480 do	do 1891	do 1	1	333
Sheep's Fescue	25 × 480 do	do 1890	do 1	..	1,500
Timothy	$\frac{1}{5}$ acre	do 1890	do 1	..	1,080

SUNFLOWERS FOR SEED AND ENSILAGE.

Two acres of Russian sunflowers were sown at three different times, May 8th, 15th and 22nd, and although there were eleven degrees of frost after the plants were up, the frost had no apparent effect on them, the early sown were the finest plants all the season. The sowing was done with a common wheat drill, in rows three feet apart, the seed dropped about one foot apart, and thinned to two feet after the plants were up ; soil clay loam. The field was kept clean with a Planet jr. cultivator during the growing season. The plants averaged 6 feet high when cut, the heads were cut with sickles on September 9th, and run through the cutting box with the fodder corn for ensilage, the seed being nearly ripe at that date.

After the heads were cut, the stalks were allowed to dry, then cut and piled for fuel. They burn well when dry and give out considerable heat, but last for a very short time. Where wood cannot be obtained they could be utilized for summer fuel, but would not be suitable for winter fires.

The following table gives full particulars of this crop.

Variety.	Sown.	When cut for silo.	Yield of heads per acre.	When cut for seed.	Yield of threshed seed per acre.	Weight of seed per bushel.	Yield of stalks per acre.	Max. diameter of heads.
Mammoth Russian..	May 8..	Sept. 9.	11,220 lbs.	Sept. 16..	35 bush...	37 lbs.....	4½ cords..	12 inches.

SILOS.

The ensilage made in the fall of 1892 from well matured and wilted North Dakota Flint Corn proved to be excellent, much better than that made from unwilted corn in 1891; only a very small quantity on top and on the west side of the silo was injured.

This year the yield of fodder corn was light and only one silo was filled, partly with corn and sunflower heads, and the balance with corn and horse beans. The silo is not yet opened for use, but judging from appearance the ensilage promises to be as good as last year.

Since the silos were built at the Experimental Farm a number of others have been built in different parts of the province, and all appear to give good satisfaction.

FIELD ROOTS.

Owing to the light rainfall during the season of growth, all kinds of field roots throughout the central and western parts of the province gave a very unsatisfactory yield, the returns on the Experimental Farm were no exception to the rule, the yield being scarcely one-half of an average crop.

The soil selected for roots was a strong clay loam, thoroughly summer-fallowed the previous year, and all weeds were kept down between the rows by the use of the Planet jr. cultivator.

The yield per acre has been calculated from the results obtained from three rows of each variety one chain long.

RESULTS OF EXPERIMENTS WITH TURNIPS DURING 1893.

Land in summer-fallow the previous year, treated with ten tons rotted manure per acre, applied in the spring of 1893. Turnips were sown in flat drills $2\frac{1}{2}$ feet apart. Two sowings were made, one on 3rd June and one on 19th June. Taken up Oct. 10th; soil, clay loam.

Variety.	Yield from Plots sown 5th June. Yield per Acre.			Yield from Plots sown 19th June. Yield per Acre.		
	Bush.	Tons.	lbs.	Bush.	Tons.	lbs.
Carters's Prize Winner	352	10	1,120	296	8	1,760
Selected Purple Top	312	9	720	293	8	1,580
Selected East Lothian	293	8	1,580	253	7	1,180
Sutton's Champion	293	8	1,580	281	8	860
Bangholm Improved	278	8	680	253	7	1,180
Skirving's Purple Top	275	8	500	231	6	1,860
Rennie's Prize Purple Top	272	8	320	246	7	760
Marquis of Lorne	253	7	1,180	234	7	40
Jumbo or Monarch	249	7	940	227	6	1,620
Carter's Elephant	234	7	40	202	6	120
Mammoth Purple Top	187	5	1,220	225	6	1,500
Monarch	139	4	340	92	2	1,520

YIELD OF MANGELS AND SUGAR BEETS.

Sown in flat drills $2\frac{1}{2}$ feet apart on clay loam soil, summer-fallowed the previous year, treated with ten tons of rotted barn yard manure applied in spring of 1893. Two sowings were made, one on 6th June and one on 20th June. The roots were pulled on 6th October.

Variety.	Yield from Plots sown 6th June. Yield per Acre.			Yield from Plots sown 20th June. Yield per Acre.		
	Bush.	Tons.	lbs.	Bush.	Tons.	lbs.
Mammoth Long Red	429	12	1,740	274	8	440
Champion Yellow Globe	420	12	1,200	386	11	1,160
Giant Yellow Intermediate	378	11	680	293	8	1,580
Gate Post	344	10	640	278	8	680
Golden Tankard	344	10	640	312	9	720
Canadian Giant	340	10	400	305	9	300
Warden Orange Globe	340	10	400	288	8	1,280
Red Globe	319	9	1,140	259	7	1,540
Red Fleshed Tankard	261	7	1,660	181	5	860
Erfurt Model	155	4	1,300	146	4	760
Green Top Brabant (Sugar Beets)	385	11	1,180	264	7	1,840
Vilmorin's Improved do	344	10	640	246	7	760
French New Rich do	322	9	1,320	264	7	1,840
Klein Wanzleben do	316	9	960	246	7	760

RESULTS OF EXPERIMENTS WITH FIELD CARROTS.

Land in summer-fallow the previous year, treated with ten tons per acre of rotted stable manure, applied in spring. Carrots were sown in flat drills eighteen inches apart. Two sowings were made, one on 6th June and one on 20th June. Soil clay loam.

Variety.	Yield from Plots sown 6th June.			Yield from Plots sown 20th June.		
	Yield per Acre.			Yield per Acre.		
	Bush.	Tons.	lbs.	Bush.	Tons.	lbs.
Large Short Vosges	154	4	1,240	146	4	760
Early Gem	147	4	820	139	4	340
Improved Short White	146	4	760	132	3	1,920
Chantenay	146	4	760	132	3	1,920
Half Long Danvers	146	4	760	95	2	1,700
White Intermediate	139	4	340	117	3	1,020
Long Red without core	110	3	600	95	2	1,700
White Belgian	110	3	600			
Carter's Orange Giant	102	3	120	95	2	1,700

POTATOES.

The potato crop throughout the central and western parts of the province is lighter this year than it has been for a number of years; the dry summer and fall reducing the yield to less than one-half of an average crop. Fortunately the eastern parts of the province fared better and are in a position to supply the deficiency in the west.

The land on the Experimental Farm selected for this crop was a stiff clay soil, very retentive of moisture and for that reason suffered but slightly from the drought, but the cold, wet soil, delayed germination in spring, making the plants late to ripen and injuring the quality so badly that tests in this particular would be misleading, and are not included in the tables this year.

The accompanying tables give particulars of this crop. The returns per acre are based on the product of 2 rows, each one chain long.

POTATOES.

Ploughed in, in rows three feet apart, one foot apart in the row; weeds kept down during the growing season with a one-horse cultivator. All were planted 26th May, and the last were taken up 5th October.

Variety.	Yield per Acre.	Earliness.	Size.
	Bush.		
Daisy	253	Late	Medium.
Rural Blush	251		do
Rose Valley	245	Late	Large.
Genessee Seedling	244	do	do
Everett	242	do	do
The Freeman	238	do	Small.
Sharpe's Seedling	236	Medium	Medium.
Dakota Red	229	Late	Large.
Polaris	229	do	do
Bruce's White Beauty	223	do	Medium.
Harbinger	220	do	Small.
Burpee's Extra Early	220	Early	
New Variety No. 1	216	Late	Large.
Empire Bell	205	do	Medium.
Holborn Abundance	201	Medium	do
State of Maine	201	Late	do
Pearce's Prize Winner	201	do	Large.
Pearce's Extra Early	196	do	do
Cream of the Valley	190	do	do
White Unknown	188	do	do
Lizzie's Pride	187	do	Medium.
Algoma	187	Early	do
American Giant	187	Late	Small.
I.X.L	183	do	Medium.
Toronto Queen	179	do	Large.
Northern Spy	174	do	do
Early Puritan	170	do	do
Green Mountain	168	do	Medium.
Crown Jewel	165	do	Large.
Lee's Favourite	165	Medium	Medium.
Early Rose	165	do	do
Thorburn's Late Rose	165	Late	Large.
Early Sunrise	161	do	do
Vanguard	157	do	do
Early Ohio	152	Very early	Medium.
Delaware	148	Late	do
Empire State	146	do	Large.
Beauty of Hebron	137	do	do
Steele's Earliest of All	135	do	Very large.
Rural Blush	128	do	Medium.
Thorburn's Paragon	110	do	do
Clarke's No. 1	106	do	Large.
Chicago Market	100	do	do
Snowdrop	95	do	Small.

SWINE FEEDING EXPERIMENTS.

Two series of experiments in swine feeding were undertaken in the winter of 1891-2, with the anticipation that supplementary tests would be made during the following summer. For this reason the results were not published in the last report. It was afterwards found impracticable to make the summer tests for want of suitable accommodations.

The building in which the swine were kept during the winter was very open and cold, the thermometer often going below zero, they were thus fed at a great disadvantage, but as the conditions were such as obtain on many farms in this country during winter, the results of these experiments may be useful as showing what can be done under very unfavourable circumstances.

FEEDING FROZEN WHEAT TO SWINE.

Two Berkshire grade pigs were selected for this experiment, they were purchased at 5c. per pound live weight, and sold at the same rate, their combined live weight when the test began 7th December, was 180 lbs. They were fed three times a day, all the chopped No. 3 or badly frozen wheat they would eat clean, mixed with cold water at the time of feeding, the building being too cold to admit of soaking the food for any length of time before using.

The accompanying table will show that this wheat, although badly injured, and fed under unfavourable conditions realized in its value in pork 49 cts. per bushel. The market value of such wheat during the winter of 1891-92, was about 30 cts. per bushel, and it would not realize 20 cts. this winter.

——	Amount of wheat consumed each month by the two swine.	Gain in pounds of pork each month.	Return per bushel of wheat fed.	Pounds of wheat consumed for one lb. of pork.		Weight of the swine at end of month.
	Lbs.	Lbs.	Cts.	Lbs.	oz.	Lbs.
First month	330	67	60	4	14	247
Second do	319	45	42	7	1	292
Third do	294	55	56	5	5	347
Fourth do	313	39	37	8	0	386

Summary.

It took on an average 6 lbs. 1 oz. of wheat during the four months, to make one pound of pork.

Average return per bushel of wheat consumed, 49 cents.

FEEDING BARLEY TO SWINE.

The two pigs selected for this test were also grade Berkshires, their combined weight at the commencement of the test, 28th December, was 117 lbs. These were also purchased at five cents per pound live weight, and sold at the same rate.

The barley was fed three times a day, chopped and mixed with water at the time of feeding. No more was fed than would be eaten up clean at each meal.

The following results show that the barley fed in this experiment realized in pork 50 cents per bushel, farmers at that time were selling the same grade of barley on the market at an average of 25 cents per bushel, a difference of one hundred per cent in favour of feeding it.

——	Amount of barley consumed each month by the two swine.	Gain in pounds of pork each month.	Return per bushel of barley fed.	Pounds of barley consumed for one pound of pork.		Weight of swine at the end of month.
	Lbs.	Lbs.	Cts.	Lbs.	oz.	Lbs.
First month	288	83	69	3	7	200
Second do	335	71	50	4	11	271
Third do	370	65	42	5	11	336
Fourth do	341	62	43	5	8	398

Summary.

It took an average of 4 lbs. 11 oz. of barley during the four months to make one pound of pork.

Average return per bushel of barley fed 50 cents.

CATTLE.

The cattle on the farm have been perfectly healthy during the year, and there have been no losses through sickness.

During the year there has been added to the herd the following calves, all bulls, viz.: two Ayrshires, two Holsteins and one each of Shorthorn and Galloway, and one Grade.

Three young bulls, one each of Holstein, Ayrshire and Galloway were sold by public auction on November 15th. The herd now consists of 7 Shorthorns, 6 Ayrshires, 7 Holsteins, 4 Galloways and 3 Grades.

A record has been kept of the yield of milk given by each cow; but as the necessary apparatus for testing the quality of the milk of the different breeds, is about to be supplied it is thought best to defer publishing the yields until the relative richness of the milk of the different breeds can be accurately determined.

FATTENING STEERS WITH FROZEN WHEAT AND BARLEY.

Recognizing the fact that the results of several years' experiments are required in almost every line before reliable conclusions can be reached, the experiments in feeding steers with frozen wheat and barley commenced in the winter of 1892-3, were continued last winter, but with three steers in each group instead of two.

Nine very even and fairly thrifty steers, raised by farmers near here, were secured for this purpose. They were all grades, Shorthorn blood predominating and about 2½ years old, they were purchased in the fall at 2½ cents per pound live weight, and sold in the spring at 3½ cents.

The nine steers were divided into three groups of three each, and fed for five months *all they would eat clean* of the following rations :—

Composition of the different Rations.

First lot of steers—

	Lbs.
Cut wheat straw	20
No. 3 frozen wheat chop	15

Second lot of steers—

	Lbs.
Cut wheat straw	15
No. 3 frozen wheat chop	9
Turnips sliced	20

Third lot of steers—

	Lbs.
Cut wheat straw	10
Barley chop	10
Turnips sliced	20

The several ingredients were spread in layers in a heap, and after being moistened were throughly mixed and fed *all they would eat up clean* the following day, in three feeds.

Feed consumed.

The total amount and cost of feed consumed during the feeding period (151 days) was as follows:—

First lot of steers—

6,344	pounds cut straw..	
4,996	" wheat chop at ½ cent per lb..........................	$24.98

Second lot of steers—

6,101	pounds cut straw..	
3,833	" wheat chop at ½ cent per lb..........................	19.16
140	bush. turnips at 5 cents per bush..........................	7.00
		$26.16

Third lot of steers—

5,140	pounds cut straw..	
5,478	" barley chop at ½ cent per lb..........................	$27.39
184	bush. turnips at 5 cents per bush..........................	9.20
		$36.59

Summary of Results	First cost of Steers.	Cost of Feed.	Price sold for.	Profit.	Daily gain of each Steer.
	$ cts.	$ cts.	$ cts.	$ cts.	Lbs. oz.
First lot of steers—Wheat and straw............	76 50	24 98	127 05	25 57	1 4
Second do Wheat, turnips and straw......	77 85	26 16	128 62	24 61	1 3
Third do Barley, turnips and straw.. ..	72 62	36 59	130 27	21 06	1 13

Last year's return from the frozen wheat fed to group 1, was equal to 56 cents per bushel, this year it equals 60 cents.

Deducting the value of turnips, the frozen wheat fed to Group 2 realized last year 61 cents per bush., this year, 68 cents.

The wheat fed was the same both years, but the steers were much quieter last winter and for that reason better feeders.

No. 3 frozen wheat sold at an average of 30 cents per bushel in the winter of 1891-2 and about 25 cents last winter.

After deducting the value of turnips, the barley fed to group 3 realized forty-two cents per bushel.

Fortunately the crops in this province have escaped injury from frost during the past two years, but in case of injurious frost occurring at any future time it is well for the farmer to know that prime beef can be made from even badly frozen wheat, and that he is not compelled to sell it at a sacrifice as is so often done.

Barley is a grain that can be sown after wheat seeding, it is seldom if ever injured by fall frost, if sown in good season, and judging from the returns obtained under field culture on this farm, it should be a profitable crop at 42 cents per bushel.

APPLE TREES.

The apple trees planted here in 1889 were divided into two lots, one lot was set out in cleared scrub land on the side hill facing the south; it is sheltered on every side by scrub 6 to 12 feet high. As the scrub on each side extends for some distance, very little snow drifted into the plots, and seldom more than six inches of snow lies on the ground each winter, this condition with the southern exposure is probably in part responsible for the heavy losses in trees each year. The other plot used as an apple orchard is in the lower part of the valley with a slightly northern exposure: this plot has simply one row of trees 7 to 15 feet high on the south, east and west sides, the north being without protection; every winter the snow drifts into this plot from 5 to 10 feet deep, completely covering the apple trees, and is not thawed out until late in the spring.

It will be seen from the following table that all the varieties of apple trees but one planted in this plot have survived the past four winters, although the growth has not been large.

The Anis apple is the most promising variety grown on the farm thus far, and it is interesting to note that Prof. Budd, of the Iowa Experimental Station, states "That this variety in Iowa is perfect in tree, and its fruit has the size, fine colour, keeping capacity and nearly the high quality of the Jonathan."

APPLE Trees planted in the valley on black loam soil, spring of 1889: plot sheltered by a row of trees on the south, east and west.

Variety.	No. of trees planted.	No. of trees alive.	Season's growth.	Present condition.	Variety.	No. of trees planted.	No. of trees alive.	Season's growth.	Present condition.
	1889	1893	In.			1889	1893	In.	
Anis red	8	8	11	Extra g'd.	Livland Raspberry	1	1	16	Poor.
Anis yellow	2	2	15	Good.	Lead	1	1	21	do
Antonovka	2	2	18	Fair.	Liebig	1	1	8	Good.
Aport	2	2	13	do	McIntosh red	1	1	18	Poor.
Alexander	2	1	18	do	Plikanoff	2	2	20	Good.
Arabka, winter	1	1	12	Good.	Pointed pipka	1	1	12	do
do summer	2	1	14	do	Peach	1	1	17	Fair.
Borovinka	1	1	16	Fair.	Repolovka	1	1	29	do
Borodovka	1	1	10	do	Red repka	1	1	9	do
Bogdanoffs Glass	1	1	11	Poor.	Simbirsk No. 2	1	1	15	do
Ben Davis	1	1	15	do	Shaker pippin	1	1	16	do
Baldwin Canada	2	1	8	Good.	Switzer	1	1	14	Good.
Christmas	1	0	....		Steklianka	1	1	30	do
Duchess of Oldenburg	4	4	18	Very good	Serinkia	1	1	28	Fair.
Grimes golden	1	1	13	Poor.	Scott's winter	1	1	19	Poor.
Golden russet	1	1	12	do	Tsiganka	1	1	16	Fair.
Grandmother	3	3	11	Good.	Tetofsky	1	1	14	do
Grand Duke Constantine	1	1	22	Fair.	Ukraine	2	2	22	do
Golden white	1	1	17	do	Winter St. Lawrence	3	3	27	Good.
Haas	1	1	13	do					

APPLE TREES planted on the upland with southern exposure, sheltered on all sides by scrub, soil light loam: trees planted spring of 1889.

Variety.	Number of Trees planted, 1889.	Number of Trees alive, 1893.	Season's growth.	Present Condition.
			Inch.	
Anis, red	2	2	25	Good.
do yellow	2	0	....	
do mottled	1	0	....	
Autumn streaked	1	0	....	
Antonovka	1	1	15	Fair.
Aport	1	0	....	
Arabka, summer	1	1	17	Fair.
do winter	1	0	....	
Borovinka	1	1	6	Poor.
Ben Davis	1	0	....	
Cross	1	1	....	Poor.
Christmas	1	0	....	
Duchess of Oldenburgh	3	3	20	Good.
Enormous	1	0	....	
German Calville	1	1	15	Good.
Gipsy girl	1	1	10	Poor.
Hibernal	1	1	20	Fair.
Kruder	1	1	13	Poor.
Liebig	4	4	22	Good.
Longfield	2	0	....	
Pointed pipka	1	1	15	Fair.
Romna	1	0	....	
Red repka	1	0	....	
Repolovka	1	1	17	Fair.
Switzer	1	0	....	
Silken	1	1	12	Good.
Tsiganka	1	0	....	
Titovka	1	1	18	Poor.
Wealthy	2	2	16	Good.

APPLE TREES PLANTED IN 1890.

Soil, light loam; southern exposure; sheltered on all sides by scrub.

Variety.	No. of trees planted.	No. of trees alive.	Season's growth.	Present Condition.	Variety.	No. of trees planted.	No. of trees alive.	Season's growth.	Present Condition.
	1890	1893	In.			1890	1893	In.	
Antonovka	2	2	18	Good.	Pointed Pipka	2	2	21	Very good
Arabka summer	1	1	25	Very good	Peach	2	2	13	Fair.
Anis	2	1	11	Good.	Red Astrachan	2	2	11	do
do red	1	1	15	do	Steklianka	2	2	17	Good.
Ben Davis	3	3	16	Fair.	Serinkia	1	1	15	Poor.
Canada Baldwin	2	1	8	Good.	Stettin Yellow	1	1	4	Fair.
Duchess of Oldenburgh	2	2	18	do	Sandy Glass	1	1	23	do
Fameuse	3	1	17	Fair.	Sugar Sweet	2	1	5	Poor.
Gipsy Girl	3	3	13	Good.	Tashkin	2	2	15	Good.
Golden russet	2	1	17	Poor.	Tiesenhausen	1	1	9	do
Grimes' golden	1	0	....		Ukraine	3	2	16	do
Hibernal	4	1	24	do	Vargulek	3	1	19	Poor.
Haas	1	1	18	Good.	Yellow Arcadian	2	1	20	Fair.
Mann	1	1	13	Poor.	Yusoff	2	2	12	Good.

APPLE TREES planted in 1892, soil light loam, plot sheltered on all sides by scrub.

Variety.	Number of trees planted.	Number of trees alive, Fall.	Present condition.	Season's growth.	Remarks.
	1892.	1893.		Inches.	
Little Hat	6	6	Fair	30	Soft growth.
Red Raspberry	6	5	do	14	do
Hare Pipka	6	6	Poor	24	Doubtful hardiness.
Peter	2	2	Good	22	Hardy growth.
Bode	6	6	do	15	do
Sugar Sweet	6	6	do	10	do
Blushed Calville	6	4	Fair	17	Winter kills.
Saccharine	6	3	Poor	20	Tender.

CRAB APPLE TREES.

Crab apple trees suffered more injury from winter-killing during last season than they have done any winter yet. One quarter of them were completely killed, and many of the others badly injured.

Ten additional Transcendents were received last spring, and have made a good growth.

CRAB APPLE Trees planted on light loam soil, with a southern exposure; trees planted spring of 1889, plots protected on all sides by scrub.

Variety.	Number of Trees Living.		Present Condition.	Season's Growth.
	1892.	1893.		
Transcendent	9	7	Extra good	34 inches; hardy growth.
Whitney's No. 20	3	2	Good	20 do do
Hyslop	7	4	do	19 do do
Orange	2	1	Fair	12 do kills back.
Early Strawberry	2	1	do	15 do do
Queen's Choice	1	1	Poor	25 do do

PLUM TREES.

Since my last report, two more varieties of plums have been winter killed, and two others have been badly injured. De Soto and Nicholas are still promising.

The native Manitoba Plum is quite thrifty under cultivation, and one of the trees planted in 1892, bore a few very fair plums of a bright red colour this season. In May last 70 additional native plum trees were transplanted from the woods, and 68 of them are living at this date.

Variety.	When planted.	No. of Trees living, 1892.	No. of Trees living, 1893.	Present condition.	Season's growth.
Bradshaw	1889	2	2	Fair	22 inches, tender growth.
De Soto	1892	2	2	Good	29 do hardy growth.
Early Red	1889	7	0		
Nicholas	....	3	3	Extra good	31 do hardy growth.
Late Red	1889	1	1	Poor	15 do kills back.
Otschakoff	1889	2	0		
Native wild Plum	1890	7	7	Good	36 do good.

CHERRIES.

This climate appears particularly severe on all cultivated varieties of cherries, each year sees two or three varieties completely killed, 6 m. and Koslov Bush Morello are now the only ones at all promising.

A native variety, the Sand Cherry (*Prunus pumila*) is found growing wild on very sandy soil throughout the province, it is a very handsome shrub when in bloom, and the fruit is decidedly the largest native variety we have, and we have no difficulty in growing it on loamy soil. Introduced trees of this variety, as well as the native, seem quite hardy, and bear each year a heavy crop of rather indifferent fruit. Possibly this variety may be the starting point for improved varieties hardy enough for this country.

Variety.	When planted.	No. of Trees alive, 1891.	No. of Trees alive, 1893.	Present condition.	Present Height.	Season's growth.
					inches.	
Bessarabian	1890	2	0	....	....	
Lutovka	1890	5	3	Poor	40	8 inches, doubtful.
6 m Cherry	1890	2	2	Fair	63	14 do hardy growth.
12 m Cherry	1891	1	0	....	....	
Koslov Bush Morello	1890	4	4	Good	30	6 do hardy growth.
Vladimir	1892	6	4	Fair	51	12 do tender growth.
Lutvoka	1892	6	0	....	....	
Bessarabian	1892	6	5	Fair	40	10 do tender growth.
Sand Cherries, Prunus pumila	1892	5	5	Good	32	15 do hardy growth.

CURRANTS.

Currants of all kinds are quite hardy here, and were well covered with blossom last spring, but the hot winds of July and August caused the immature fruit to drop off, shrinking the fruit to one-half an average crop. Below will be found a description of the varieties that have fruited here, also the yield from ten average bushes. In addition to the lists given below, 13 seedlings were planted in 1891, and nine named varieties last spring. All of these are growing and will be reported on as soon as they fruit.

Variety.	Number of Trees living. 1892.	1893.	Color.	Size.	Flavour.	Yield of 10 average bushes.
Lee's Prolific	426	426	Black	Very large	Excellent	18 lbs.
Champion	10	10	do	Large	Poor	17 do
Naples	100	100	do	Very large	Good	10 do
Native, Large var	40	40	Brown black	Medium to large	Strong	
do , Small var	8	6	Jet black	Small	Bitter	
Raby Castle	202	202	Red	do	Good	13 do
Fay's Prolific	24	16	do	Large	do	14 do
Victoria	13	9	do	do	do	10 do
Cherry	140	140	do	do	do	10 do
White Grape	170	170	White	Very large	Choice	15 do
Prince of Wales	8	8	Planted in 1892			Very little fruit.
Prince Albert	17	17	do			do
Versaillaise	12	12	do			do
London Red	12	12	do			do

GOOSEBERRIES.

The last of the Downing gooseberries were winter-killed last year, and that variety is evidently too tender for this country.

Smith's Improved and Houghton continue hardy, and the Houghton produced this year about one pound of fruit per bush.

A fine collection of nineteen new varieties were received last spring, these have all rooted and will be reported on next year.

RASPBERRIES.

The yield of raspberries in common with all the small fruits was this year seriously diminished by the summer drought. The Turner and Philadelphia are quite hardy, and do not appear to require covering here, the other varieties need protection by bending down and covering with a little soil and manure.

Among the black caps the Hilborn has thus far been the best bearer, and is as hardy as any other of the tip varieties.

In addition to the list of varieties given below, three seedlings sent from the Central Experimental Farm in 1890 have proved hardy and fruited last season, the original plants of these were divided this year and for that reason did not fruit.

Variety.	Number of plants living. 1892.	1893.	Size.	Colour.	Flavour.	Remarks.
Turner	200	200	Medium	Red	Good	Hardy.
Philadelphia	200	200	Medium to small.	do	do	Extra hardy.
Cuthbert	150	150	Large	do	Excellent	Half hardy.
Marlboro'	50	50	Extra large	do	do	Hardy.
Reider	35	35	do	do	Good	Early and hardy.
Caroline	20	19	Medium	Yellow.	do	Late and tender.
Golden Queen	20	18	do	do	do	Tender.
Hilborn (black cap)	150	150	Extra large	Black	Excellent	do
Nevada blackberry	50	10	Large	do	Fair	do
Gainor blackberry	50	5				do
Wachusett's Thornless blackberry	50	8	Large	Black	Fair	do

FOREST TREE PLANTING.

This portion of the Experimental Farm work has given very satisfactory results during the past season.

The trees set out in nursery rows and shelter belts have generally made a rapid growth. The avenues have also done remarkably well. The accompanying cut (Fig. 4) is from a photograph showing a part of one of these avenues leading from the main road to the superintendent's house. Considerable additions have been made to the collection of forest trees and shrubs this year.

FIG. 4.—PART OF AVENUE OF MANITOBA MAPLE, EXPERIMENTAL FARM, BRANDON, MAN.

In June last I made a visit to Rat Portage, and procured from there a collection of native trees of the following varieties: White Pine (*Pinus Strobus*), Jack Pine (*Pinus Banksiana*) and Red Pine (*Pinus resinosa*) White Spruce (*Picea alba*), Black Spruce (*Picea nigra*), Balsam Spruce (*Abies balsamea*), also plants of native Sumach and Labrador Tea (*Ledum latifolium*). Although these were moved rather late in the season many of them have rooted, and will make interesting additions to the collection; there are still other varieties of trees and shrubs found in that district that have not been tested here and which it would be desirable to obtain as soon as practicable.

A number of Riga Pine, Norway Spruce and Native Oak (*Quercus macrocarpa*), the latter from seed gathered here, and a very full collection of Lilacs, Spireas with other shrubs were received from the east last spring; these have nearly all rooted and will be reported on later.

FOREST TREES AND SHRUBS PLANTED IN SPRING OF 1892.

In the fall of 1891 a number of forest trees and shrubs were received from the Central Experimental Farm, these were heeled in over winter and planted the

following spring: although they were nearly covered with soil, many of the trees failed to start in the spring.

The following list includes all the varieties that rooted, with their growth and present condition.

Variety.	Number of Trees planted, 1892.	Number of Trees alive, 1893.	Season's growth.	Present Condition.
			Inches.	
Artemisia Abrotanum (Eng var)	4	4	14	Hardy growth.
do do (Russian)	25	25	49	do
Alnus glutinosa	15	15	9	do
Acer Tataricum	2	1	Small.	Tender.
do Pennsylvanicum	1	1	7	do
Butternut	10	0	....	
Berberis Thunbergii	20	20	4	Kills back badly.
Birch, white	20	20	13	Hardy.
do yellow	20	20	12	do
Clematis viticella	1	0	....	
Crataegus coccinea	1	0	....	
Caragana frutescens	6	4	5	Tender.
Picea excelsa	25	19	11	Half hardy.
do alba	10	4	5	do
Pyrus Americana	5	5	18	Half hardy.
Pyrus Aucuparia	25	23	17	do
Pyrus Toringo	2	2	7	Healthy.
Ptelea trifoliata	3	3	....	Small.
Rhamnus infectoria	2	1	6	Tender.
Ribes aureum	4	1	4	do
Spiræa opulifolia	100	100	60	Very hardy.
Syringa Josikæa	25	25	15	do
do Rothmagensis	5	5	10	Healthy.
Salix Babylonica annularis	2	1	5	Winter kills.
Sambucus aurea	5	4	30	Tender growth, very handsome.
Syringa vulgaris	25	25	14	Very hardy.
Virginian creepers, native	195	195	24	Hardy.
Viburnum Lantana	10	5	6	Half hardy.

THE RATE OF GROWTH IN TREES ON THE EXPERIMENTAL FARM.

A number of trees were planted on the farm in 1889, from one year seedlings and rooted cuttings of the same age, these were measured this fall, and below will be found their height and also circumference one foot from the ground.

It will be seen from these measurements that forest tree protection can be quickly obtained on the rich soils of our prairies, and there is now no necessity for confining the planting to one or two varieties, as a very fair collection of useful sorts are now proven to be hardy.

Variety.	Height.	Circumference at butt.	Remarks.
Populus Bereolensis	14 feet.	13 inches.	Trimmed tree shape.
do Wobstii Riga	15 do	12 do	do
do Siberica	10 do	10 do	do
Cottonwood	12 do	10 do	do
Salix Voronesh	11 do	4 do	Bush.
do acutifolia	9 do	6 do	do
Ash-leaf Maple	12 do	10 do	do
Native White Elm	10 do	5 do	Tree shape.

Last spring the planting around the superintendent's house was commenced and the following trees and shrubs were set out, nearly all of which have been tested on the farm and found hardy.

TREES.

Ash white, Fraxinus Americana.
Alder European, Alnus glutinosa.
Ash Mountain, Pyrus Americana.
Acer ginnala, Asiatic maple.
Birch, native.
Birch, cut leaved, weeping.
Beech, Fagus ferruginea.
Arbor-vitæ globe, Thuya occidentalis globosa.
Arbor-vitæ common, Thuya occidentalis.
Elm Manitoba white, Ulmus Americana.
Poplar, Populus tremuloides.
Balm Gilead, Populus balsamifera.
Russian Poplar, Populus Petrovsky.
do do Siberica.
Russian Poplar, Populus Alba argentea.
do do bereolensis.
do do certinensis.
do do Voronesh.
Pine, Jack Pine, Pinus Banksiana.
do Scotch, Pinus sylvestris.
Spruce native white, Picea alba.
do Ont. do do
Willow Voronesh, Salix Voronesh.
do Sharp leaved, Acutifolia.
do Golden leaved, Aurea.
do Laurel leaved, Laurifolia, French.
do do do true.

SHRUBS.

Southernwood, Russian, A. abrotanum Var. Tobolskiana.
do European, A. abrotanum.
Barberry purple, Berberis vulgaris purpurea.
do Thunbergii.
do common, Berberis vulgaris.
Cherry, ground or sand, Prunus pumila.
Siberian Dogwood, Cornus Sibirica.
Caragana pendula. Weeping Caragana.
do arborescens. Siberian Pea-tree.
Caragana mollis glabra.
Cytisus capitatus.
Currant flowering, Ribes aureum.
Elder golden, Sambucus aurea.
Honeysuckle, Tartarian.
Snowberry, Symphoricarpus.
Hazel nut, Corylus Americana.
do do rostrata.
Cornus native.
Cranberry, Viburnum opulus.
Sheepberry, do lentago.
Honeysuckle, native.

Lilac Alba.
do Siberian, white.
do de Marley.
do vulgaris.
do Lemoinei, fl. pl.
do purpurea.
do Princess Alexandra.
do Josikea.
do Prince of Wales.
do Albert the Good.
do Alba grandiflora.
do Jaques Cabot.
Olive Russian.
Philadelphus coronarius. Sweet Syringa.
do Gordonianus. Gordon's syringa.
do primulæflorus. Primula flowered syringa.
do Yokohama. Japanese syringa.
Rose, native, Manitoba.
Spiræa Douglasi.
do semperflorens.
do superba.
do opulifolia.
do van Houttei.
do Billardi.
do Californica.
do floribunda.
Saskatoon, native, Amelanchier alnifolius.
Viburnum Lantana.

EXPERIMENTS WITH TREES AS WINDBREAKS.

The windbreaks surrounding the 12 plots mentioned in my last report, have continued healthy, and none of them have been injured by insect enemies.

The gaps among the cotton woods caused by cuttings not striking, have been filled with layered plants, these have all rooted and have made considerable growth.

The Russian Poplar (Populus bereolensis) and Salix acutifolia are decidedly the most promising for this purpose. Ash Leaf Maple and Elm are also thickening up well, but the Native Green Ash is growing very slowly.

These plots are in the most exposed situation on the farm, and before the windbreaks were planted, the crops sown in this field suffered severely from wind storms. This year all the plots were sown with rye or barley, and none were injured by wind, and all produced a very heavy crop.

To maintain an even growth, the tallest trees among the Willows, Maples, and Elms have been cut back. This is done quickly with a sickle, this encourages side growth, and thickens up the hedge.

In the following table particulars are given of the growth of each of the plots enclosed, the distance between the young trees in each wind break, and the growth made by each.

Variety.	Size of Plot inclosed in feet.	Distance apart of Trees.	Average Season's Growth.	Average Height.		Remarks.
			Inches.	Ft.	In.	
Ash-leaf Maple..............	78 × 330	1 × 2	22	5	0	Healthy growth.
do	78 × 330	2 × 3	26	6	0	Appears the best.
do	78 × 330	2 × 2	29	6	0	Healthy growth.
do	90 × 330	3 × 3	18	4	0	Healthy.
do	102 × 330	2 × 2	25	5	6	do
do	304 × 66	4 × 4	13	4	0	do
do	304 × 66	1 × 2	12	3	6	do
do	304 × 66	2 × 2	14	3	6	Exposed to wind.
Native Green Ash...........	304 × 66	2 × 2	6	2	6	Small growth, healthy.
do	304 × 66	4 × 4	10	2	6	do do
Native White Elm	304 × 66	2 × 2	14	4	0	Very healthy.
Populus Bereolensis.........	304 × 66	4 × 4	30	8	0	Already an effective hedge.
Cottonwood..	304 × 66	3 + 3	25	3	0	From cuttings, healthy.
Salix acutifolia..............	304 × 66	4 × 4	36	7	0	An excellent wind break.

The accompanying cut (Fig. 5) is from a photograph of one of the earliest planted hedges on the Experimental Farm.

Fig. 5.—HEDGE OF MANITOBA MAPLE, EXPERIMENTAL FARM, BRANDON, MAN.

FOREST TREE AND SMALL FRUIT DISTRIBUTION.

This branch of the farm work increases each year.

Applications for fifty-nine thousand forest tree seedlings and cuttings, twelve thousand small fruit cuttings, and four hundred one pound bags of maple seed were received last winter. As the applications for forest trees exceeded our supply, ten thousand of these were sent from the Central Experimental Farm, the balance were supplied from trees grown here.

Favourable reports are being received of the trees sent out in former years, and in some instances cuttings are already being made from those sent out in 1890.

One hundred thousand cuttings are being prepared for next year's distribution.

The packages were sent by mail and each contained one hundred trees and cuttings as follows :—

Variety.	Number.	——
Ash-leaf maple	28	Trees.
Cottonwood	15	Cuttings.
Artemisia Abrotanum	10	do
Native white elm	10	Trees.
Poplar bereolensis	4	Cuttings.
do Petrovsky	10	do
do certinensis	1	do
do alba argentea	1	do
do Wobstii Riga	1	do
Willow Voronesh	10	do
do acutifolia	10	do
	100	

TABLE VARIETIES OF CORN.

The past season was favourable to the early maturing of corn, and eight of the ten varieties tested produced ears fit for the table.

All were planted in hills three feet apart each way in May and kept free from weeds during the season of growth.

Variety.	Weight of corn per dozen, green.	When fit for table use.	Remarks.
	Lbs.		
Manitoba Squaw corn	3	Aug. 15	The earliest, but flavour poor.
Mitchell's Extra Early	4	do 19	An improved Squaw corn.
Early Minnesota	5½	do 20	Fair flavour.
Early Marblehead	3½	do 23	do
Perry's Hybrid	5½	do 23	do
Burlington	4½	do 23	Good flavour ; one of the best.
Crosby's Early sugar	4	do 24	do , and sweet.
Burpee's First of All	5½	do 25	do ,
Stowell's Evergreen	None.	....	
Early Champion	do	....	

LETTUCE.

Eighteen varieties of lettuce were tested on the Experimental Farm this year, seven of these were almost identical, and no doubt are the same variety under different names. All were sown in the open on 20th April.

A second sowing was made on 15th May, but the hot weather interfered with the growth of many of the varieties.

Variety.	Weight at maturity.	When started to seed.	Earliness.	Quality.	Remarks.
Silesian	26 oz	July 30	Early	Tender	Wrinkled.
Denver Market	18 oz	Aug. 1	do	do	do
Blonde Beauty	16 oz	July 27	do	Fair	Slightly wrinkled.
Paris Sugar	15 oz	" 27	Late	Tender	Smooth.
Drumhead	12 oz	" 15	do	Fair	do
Nonesuch	8 oz	Aug. 1	do "	do	do and flat.
St. Louis	14 oz	" 2	do "	do	do
Hanson	17 oz	" 1	do "	do	Slightly wrinkled.
Golden Sunset	14 oz	July 25	Medium	do	do do
Nonpareil	22 oz	Aug. 2	do	Very tender.	do do
Hamilton Market	16 oz	July 25	do	do	do do
Rosedale	13 oz	Aug. 1	do	do	do do
Trianon's White Star	12 oz	" 1	do	do	do do
Excelsior	17 oz	July 25	do	do	do do
Gardeners' Favourite	10 oz	Aug. 4	do	do	do do
Boston Market	16 oz	July 20	do	do	do do
Toronto Gem	17 oz	Aug. 1	do	do	do do
Trianon's Cos	20 oz	" 1	do	do	Cos. shape.

CAULIFLOWERS.

Fifteen varieties of cauliflowers were tested on the farm, the season was very unfavourable for this plant and only the early varieties headed.

The following were the best this year: Thorburn's Gilt Edge, Steele's Extra Early, Extra Early Paris, and Extra Early Erfurt.

RHUBARB.

Mention was made in my last report of the usefulness of this plant here.

The series of experiments with seedlings commenced last year were continued this year; and the roots of twenty standard varieties were obtained from the United States and Britain, these were set out and will be reported on next year.

A few of the best plants of Victoria and Tottle's Improved Seedlings were allowed to ripen seed, each plant produced about 3 oz. of seed containing 1,800 seeds per oz.

The stalks of the plants set out last year were pulled every ten days and weighed; below will be found the returns per plant, &c., as the plants were set 4 x 4 feet the returns per acre were in some instances very large.

Variety.	Origin.	Ready for use.	Yield from each plant. Lbs.	Oz.	Quantity.
Manitoba Seedling No. 1	Seedling of Victoria	May 26	21	02	Choice, tender.
do No. 2	do Myatt's Linnæus	do 28	19	13	Good do
do No. 3	do Johnston St. Martin	June 1	6	00	Green, hard, poor.
do No. 4	do Stotts Mammoth	do 10	5	11	Fair quality.
Tottle's Improved	Root from J. Tottle, Stonewall	do 1	18	13	Good, tender.

TOMATOES.

Three varieties only of tomatoes were planted on the farm this year. All were sown in hot beds and transplanted to the open ground 1st June.

The first to ripen was Steele's Earliest of All, a large wrinkled variety; this ripened on 22nd August and yielded 23 lbs. from ten plants.

Atlantic Prize, nearly smooth, and large, ripened 30th August and gave a return of 20 lbs. from ten plants.

Dwarf Champion a smooth variety, medium size, ripened 1st September and gave 1 lb. per plant of choice tomatoes.

FLOWERS.

Recognizing the fact that the surroundings of many of the farms in this province require to be made more attractive if the young people are to remain contented with a rural life, some attention has been paid each year to testing the hardier varieties of annual and perennial flowering plants.

As many of the perennial plants require very little skill or attention, a special effort has been made to collect and test the varieties likely to be hardy here.

The following have so far been found quite hardy, if protected with a few inches of litter; and have flowered freely on the dates mentioned.

PERENNIAL FLOWERS.

Variety.	Season of Flowering.	Remarks.
Tulips, single, double and parrot..	20 May to June 15........	Can remain in ground for years.
Crocus..........................	2 do to May 15.........	do do do
Scilla Siberica............ ...	1 do to do 15.........	do do do
Pansies	1 do to fall frost.......	do do do
Sweet William..................	20 June to do	Should be renewed every two years.
Pæonies herbaceous.............	1 July to July 20.........	Can remain in ground for years.
Perennial Flax................ ..	15 May to Aug. 1.........	do do do
Delphinium, Perennial...........	20 July to frost......	do do do
Columbine..	1 do to Aug. 1.........	do do do
Bleeding Heart..	20 do to do 1.........	do do do
Day Lily.......................	1 do to do 1........	do do do
Tiger Lily.......	15 do to do 1.........	do do do
Pinks, from seed..................	1 Aug. to frost	
Gladioli collection................	18 do to severe frosts....	Bulbs require to be stored in winter.
Hyacinthus candicans.............	1 Sept.........	do do do

ANNUALS.

Variety.	Season of Flowering.	Remarks.
Larkspur........................	10 July to Aug. 1.........	Easy of culture and free bloomers.
Phlox Drumondii....	15 do to fall frost..	do do do
Escholtzia......	15 do to do	do do do
Zinnia..........................	20 do to do	do do do
Mignonette.....................	20 do to do	do do very fragrant.
Godetia........................	25 do to do	do do free bloomers.
Salpiglossis......................	13 do to Aug. 30........	do do do
Hibiscus........................	1 Aug. to fall frost........	do do do
Marigold........	15 do to do	do but late to bloom.
Stocks.........................	1 do to do	do and fragrant.
Sweet Peas.	1 July to do	Must be sown early.
Asters........	1 do to do	do do to succeed.
Balsams.............	15 Aug. to do	do do do
Verbena..............	20 July to do	Easy of culture and free bloomers.
Portulacca...........	1 do to do	do do do

FARMERS' INSTITUTE MEETINGS.

During the past winter a number of additional farmers' institutes have been organized throughout the province, and invitations to address meetings have in

consequence largely increased, although more of this work was undertaken than in any previous year, I regret that other duties did not permit of my accepting all the invitations received.

Institute and other meetings were attended at the following places by invitation and the papers mentioned read by me:—

Wawanessa,	13th	January,	"Experiments in feeding Steers," full meeting.
Winnipeg,	18th	do	Dairymen's Convention, "Fodders and Grasses."
Glenboro,	20th	do	"Preventives of smut," small meeting.
Rapid City,	18th	February,	"A Review," crowded house.
Douglas,	25th	do	Dairy meeting, "Fodder for cows," full house.
Niverville,	27th	do	"Summary of experiments," good meeting.
Morris,	28th	do	do do large attendance.
Elkhorn,	4th	March	"Cattle feeding," good attendance.
Virden,	11th	do	"Grasses and feeding steers."
Carberry,	12th	do	"Varieties of wheats," small attendance.

Portage la Prairie, 22nd March, "Grasses and Fodder Plants," large attendance.

Hartney,	23rd March,		"A Review," good attendance.
Hartney,	11th May,		"Summer-fallow," full attendance.
Elkhorn,	3rd June,		do good attendance.
Russell,	6th	do	"Grasses and Fodder plants."
Birtle,	8th	do	"Summary of experiments."

TILE DRAINAGE.

Three fields on this farm, two of twenty acres, and one of two acres, have each year been more or less flooded during the spring freshets, making it difficult to utilize them for early sown crops, one field in particular remained flooded until July this year, it was found impracticable to remove the water from this field by surface drainage, and a system of tile under drainage has been commenced, 3,400 feet of this was completed during the fall, and the balance is expected to be in place in time next spring to prepare the land for barley seeding.

WINDMILL.

The 12-foot steel windmill mentioned in my last report, has so far given entire satisfaction, and has cost nothing for repairs since its erection.

Although located directly under a hill one hundred feet high, it pumps the water, grinds the feed, and cuts all the straw required for 35 head of cattle and ten horses.

With a moderate wind it pumps eleven barrels of water per hour, and with a stiff breeze grinds 16 bushels of oats, or 8 bushels of barley per hour.

Fodder corn for ensilage was also cut by wind power this year, one ton was cut into inch lengths in nine minutes, by a Watson Excelsior cutting box.

NEW BUILDINGS.

A frame implement and carriage building 28 x 72 feet has been erected this year.

Part of the ground floor will be used for storing implements and carriages, and the south end has been partitioned off as an exhibition room for produce grown on the farm.

The upper story is utilized for sorting and cleaning grain for seed and exhibition purposes. This building is close to the bank barn and will be a great convenience.

Poultry runs made of wire netting seven feet high and 60 feet long have been constructed in connection with the poultry house. Now that it is possible to keep the different breeds of poultry separate, we hope to be able to test their suitability for this country.

METEOROLOGICAL.

In July 1889 this farm was supplied from the Dominion Meteorological Service with a set of instruments including four thermometers, rain gauge, wind vane, sunshine recorder, &c., since that date observations have been taken three times each day and monthly returns forwarded to the Central Office at Toronto for publication.

Below will be found the maximum and minimum thermometer readings for the past ten months, also the amount of rainfall and sunshine for the growing season.

RAINFALL.

	Inches.
April	·1
May	·9
June	2·3
July	1·5
August	·7
September	1·4
Total	6·9

SUNSHINE.

	Hours.
March	191·0
April	126·5
May	278·6
June	206·6
July	286·5
August	287·4
September	221·0
Total	1,597·6

TEMPERATURE.

Months.	Maximum.	Minimum.
	°	°
January	30·5 on 8th.	— 47 on 29th.
February	32·6 on 20th.	— 52 on 1st.
March	40·4 on 31st.	— 31 on 15th.
April	59·6 on 30th.	—3·6 on 1st.
May	88·3 on 18th.	21·3 on 25th.
June	95·6 on 11th.	37·5 on 9th.
July	96·3 on 20th.	35·6 on 9th.
August	106·4 on 7th.	30·6 on 28th.
September	93·4 on 3rd.	11·6 on 27th.
October	63·5 on 19th.	8·3 on 25th.

AGRICULTURAL EXHIBITIONS.

Unfortunately a large proportion of the agricultural fairs in this province are held about the same date and only a few can be attended each year.

This year two fairs were attended on the main line of the Canadian Pacific Railway, two on the Pembina Branch, and one on the Manitoba and North-western Railway.

A full collection of grain threshed and in the straw, field roots, fruits, &c., was shown at the following places :

Brandon, 25th and 26th July.
Pilot Mound, 3rd and 4th October.
Manitou, 5th and 6th do
Neepawa, 10th and 11th do
Carberry, 12th and 13th do

EXHIBITS FOR THE WORLD'S COLUMBIAN EXPOSITION.

In addition to the collection of field roots, garden vegetables and preserved fruit mentioned in my last report, as having been sent to Chicago, in November, 1892. sixteen cases of grain samples, threshed and in the straw were shipped to Chicago in March last, these were shown in connection with the Dominion Exhibit in the Agricultural Hall. Two awards were received in Chicago for these exhibits.

It was intended to supplement the farm exhibit with fresh vegetables from time to time, but owing to the unfavourable season this was found impossible.

VISITORS TO THE FARM.

It is evident by the rapidly increasing number of visitors each year, that interest in the work of the farm is not abating. This year 11,400 visited the farm, an increase of 6,000 over last year.

The Central Farmers' Institute again held their annual picnic on the farm, the Patrons of Industry also joined with them and it was estimated that over 2,000 persons attended; nearly all of whom were farmers and their families.

The farm was also visited by a large number of delegations from the United States, Britain and the continent of Europe. These parties were shown over the farm, its objects explained, and every opportunity given them to gain information as to the agricultural capabilities of this part of the province.

CORRESPONDENCE.

During the ten months since my last report, 1,817 letters have been received and 2,332 letters despatched from this office; the correspondence includes inquiries regarding nearly every branch of agriculture and horticulture and often entails considerable labour and research.

I have the honour to remain, sir,

Your obedient servant,

S. A. BEDFORD,

Superintendent.

EXPERIMENTAL FARM FOR THE NORTH-WEST TERRITORIES.

REPORT OF A. MACKAY, SUPERINTENDENT.

INDIAN HEAD, N. W. T., 31st October, 1893.

WM. SAUNDERS, Esq.,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith my sixth annual report of work done on the North-west Experimental Farm during the year 1893.

Except roots and potatoes, crops of all kinds on the experimental farm were good the past season. A hot wind on the 6th of August made the weight of grain less than usual, but the yields in almost all cases were satisfactory.

GENERAL VIEW, EXPERIMENTAL FARM, INDIAN HEAD, N. W. T., SHOWING PORTION OF FOREST SHELTER BELT. (FROM A PHOTOGRAPH).

The spring opened much later than usual, but no severe night frosts occurred afterwards and winds not being severe the grain came up evenly and made rapid advancement during the growing season.

Rain fell in abundance on the Experimental Farm and induced too much stooling on well worked land which, with warm weather caused a very rank growth of straw in several plots, but except in low places no lodging occurred.

In consequence of favourable weather, grain matured in less time than usual. The harvest commenced on August 8th when plots of oats and barley were cut and everything was in stook by the end of that month. During the whole harvest the weather continued so favourable that not over one-half day was lost in cutting and drawing in. Broken weather has taken place since harvest, but there has not been sufficient rain to do any good to the root crop, consequently the roots and potatoes on the farm were comparatively poor.

WHEAT.

Forty-seven varieties of wheat were tested the past season. Of these, 20 were sorts tried before, 8 were new varieties obtained from commercial sources and 19 were cross-bred wheats produced at the Central Experimental Farm.

FIELD PLOTS.

Thirty acres of clean fallowed land were sown with Red Fife for the purpose of obtaining a large quantity of clean and pure seed for distribution.

The soil of this field was unfortunately somewhat lighter than the average and the grain suffered from the extreme heat of 6th August and though sound and good for seed is not as plump as it would otherwise have been. The yield of straw and grain was large, but the sample will scarcely grade No. 1.

Six varieties, Wellman's Fife, Red Fern, White Fife, White Connell, Ladoga and Johnstons, had two acres each allowed them. These were sown on fallow but on different dates on account of wet places in the field. All suffered from the heat and in quality or quantity did not turn out as well as Red Fife although sown in the same field.

Following will be found the results in detail.

TESTS OF WHEAT IN FIELD PLOTS.

Name of Variety.	Acres.	Sown.	Headed.	Ripe.	Matured in.	Height.		Condition.	Yield per acre.		Weight per bushel.
						Ft.	in.		Bus.	Lbs	Lbs.
Red Fife	24	Apr. 22.	July 20..	Aug. 23..	124 days..	4	7	Very heavy	35	00	61½
do 1½ bu. seed.	3	do 24.	do 20..	do 23..	122 do ..	4	7	do	35	50	62½
do 2 do .	3	do 24.	do 20..	do 23..	122 do ..	4	7	do	37	20	62
Johnston's.......	2	May 1.	do 20..	do 23..	115 do ..	4	6	Medium ..	27	40	56½
Wellman's Fife. ..	2	do 1.	do 20..	do 22..	114 do ..	4	6	do ..	29	30	60
Red Fern.........	2	do 1.	do 19..	do 28..	120 do ..	4	6	Straw soft.	23	40	57½
Ladoga...........	2	do 1.	do 17..	do 19..	111 do ..	4	7	Medium ..	25	10	58½
White Fife.	2	do 10.	do 24..	do 31..	114 do ..	4	6	do ..	32	16	61½
White Connell....	2	do 10.	do 24..	do 31..	114 do ..	4	6	do ..	30	00	61

TEST OF SOWING WHEAT AT DIFFERENT DEPTHS.

Red Fife was used for this test and two inches proved to be the right depth for last season, as well as for 1892.

Name of Variety.	Depth Sown.	Sown on.	Headed.	Ripe.	Matured in.	Height.	Condition.	Yield per acre.	Weight per bush.
						Ft. in.		Bush.	Lbs.
Red Fife.........	2 in.	May 4..	July 23..	Aug. 25..	114 days..	4 8	Good.....	41·20	62
do	2½ in.	do 4..	do 23..	do 26..	115 do..	4 8	do	37·10	61

TEST OF SOWING PLOTS A WEEK APART.

Two varieties, Red Fife and Campbell's White Chaff were sown at the earliest possible date, 19th April, and seedings continued one week apart for 6 weeks, until 22nd May. The plots were one-tenth of an acre each.

In this test Campbell's White Chaff, which is a soft wheat, matured from one to two days ahead of Red Fife and all the plots came in in the order sown with seven days' difference in time of ripening between the first seeding of Red Fife and the last. The best yields were from second and third weeks' sowing. Following are dates of seeding, yield, &c.

RESULTS OF SOWING WHEAT AT DIFFERENT DATES.

Name of Variety.	Sown.	Headed.	Ripe.	Matured in.	Height.	Condition.	Weight of Straw.	Yield per acre.	Weight per bush.
				Days.	Ft. in.		Lbs.	Bus. lbs.	Lbs.
Red Fife..........	April 17..	July 19..	Aug. 23..	129	4 6	Stiff & good.	356	24 40	60½
do	do 24..	do 20..	do 25..	124	4 6	do ..	333	31 10	61½
do	May 1..	do 22..	do 26..	118	4 6	do ..	458	37 ..	62½
do	do 8..	do 22..	do 26..	111	4 6	do ..	375	32 30	62
do	do 15..	do 23..	do 28..	106	4 6	do ..	330	30 ..	61
do	do 22..	do 26..	do 30..	101	4 6	do ..	325	29 10	61½
Campbell's W. Chaff.	April 17..	do 18..	do 21..	127	4 10	Good.....	291	26 30	58
do ..	do 24..	do 19..	do 23..	122	4 10	do	369	31 40	58½
do ..	May 1..	do 21..	do 25..	117	4 10	do	319	30 10	61
do ..	do 8..	do 21..	do 26..	111	4 10	do	357	25 30	56½
do ..	do 15..	do 23..	do 27..	105	4 8	do	370	30 ..	57
do ..	do 22..	do 25..	do 28..	99	4 8	do	341	29 50	57½

TEST OF DIFFERENT VARIETIES SOWN SAME DATE, ONE-TENTH ACRE EACH.

To test the question of earliness as well as yield, 35 varieties of wheat were sown on the same day, on as uniform a piece of ground as possible. The land had been fallowed the year previous, receiving one ploughing and several surface cultivations. The soil being rather lighter than the average, all the varieties suffered a good deal from hot wind on August 6th. Twelve of the varieties were cross-bred wheats and like the older sorts were injured, which caused the grain to be small and shrunken.

In earliness, four of the cross-bred sorts, Beta, Albert, Abundance and Ottawa, —crosses between Red Fife and Ladoga—Gehun, an Indian variety, and Ladoga were first.

In yield Gehun, a wheat received several years ago from India gave the highest, closely followed by one of the cross-bred sorts and four of the older kinds. Gehun was also the best sample.

Following are the varieties tested, date sown, date of heading, &c., &c.

TESTS OF VARIETIES OF WHEAT, ALL SOWN SAME DAY, ONE-TENTH ACRE EACH.

Name of Variety.	Sown.	Headed.	Ripe.	Matured in.	Height.		Weight of Straw.	Yield per Acre.		Weight per bush
				Days.	Ft.	in.	Lbs.	Bus.	lbs.	Lbs.
Red Fife	May 3	July 21	Aug 25	115	4	8	380	30	00	59½
Wellman's Fife	do 3	do 21	do 27	117	4	6	372	31	20	60
White Fife	do 3	do 22	do 27	117	4	6	375	30	50	60
Campbell's W. Chaff	do 3	do 22	do 26	116	5	0	390	28	20	60½
White Connell	do 3	do 22	do 26	116	4	6	348	35	20	59½
Campbell's Triumph	do 3	do 20	do 24	114	4	6	380	30	00	59½
White Russian	do 3	do 22	do 22	112	4	0	392	28	00	56½
Hungarian Mountain	do 3	do 22	do 23	113	4	0	399	26	50	57½
Great Western	do 3	do 20	do 27	117	4	6	359	35	30	61½
Hueston's	do 3	do 22	do 26	116	4	6	346	35	41	61½
Ladoga	do 3	do 18	do 18	108	4	8	391	33	10	57
Red Fern	do 3	do 20	do 23	113	4	0	402	31	20	60
Pringle's Champlain	do 3	do 19	do 23	113	4	3	394	32	40	59
Rio Grande	do 3	do 23	do 24	114	4	0	426	27	20	57½
Colorado	do 3	do 18	do 22	112	4	8	396	32	20	60½
Azima, Russian	do 3	do 22	do 26	116	4	6	389	33	30	62
Black Sea	do 3	do 20	do 23—	113	4	6	404	31	00	57½
Herisson Bearded	do 3	do 19	do 27	117	4	6	500	30	00	61
Prince No. 1, cross-bred	do 3	do 19	do 20	110	4	6	406	27	20	56½
do 2, do	do 3	do 19	do 20	110	4	6	378	32	00	57½
Advance do	do 3	do 20	do 21	111	4	3	381	34	30	60½
Carleton do	do 3	do 21	do 21	111	5	0	436	27	20	56
Crown do	do 3	do 21	do 26	116	5	0	392	34	40	60½
Preston do	do 3	do 19	do 21	111	4	6	410	30	40	58
Beta do	do 3	do 19	do 18	108	4	8	448	25	20	56½
Albert do	do 3	do 20	do 18	108	4	8	467	22	10	56½
Abundance, cross-bred	do 3	do 19	do 18	108	4	0	465	22	30	56
Ottawa do	do 3	do 18	do 18	108	4	6	397	33	50	57
Stanley do	do 3	do 19	do 21	111	4	8	489	35	10	59½
Alpha do	do 3	do 20	do 22	112	4	0	404	32	40	60½
Golden Drop	do 3	do 20	do 25	115	4	0	403	27	00	60½
Old Red River	do 3	do 22	do 26	116	4	3	395	28	20	60½
Red Fife (from Saskatoon)	do 3	do 20	do 27	117	4	8	454	24	00	60½
Gehun	do 3	do 10	do 18	108	3	3	322	37	40	64½
Australian	do 3	do 20	do 26	116	4	8	336	35	40	59½
Johnston's	do 3	do 20	do 26	116	4	6	456	31	20	60

TEST OF SOWING DIFFERENT QUANTITIES OF SEED PER ACRE.

In this test Red Fife was used and sown on 3rd May. The highest yield was obtained from 1¼ bushels per acre closely followed by 1½ bushels seed. All the plots ripened together.

Name of Variety.	Seed per acre.	Sown.	Headed.	Ripe.	Matured in.	Height.	Yield per acre.	Weight per bush.
	Bush.				Days.	Ft. in.	Bus. lbs.	
Red Fife......................	1	May 3..	July 23..	Aug. 28..	118	4 6	38 50	62½
do	1¼	do 3..	do 23..	do 27..	117	4 6	40 00	60½
do	1½	do 3..	do 23..	do 27..	117	4 6	39 40	62
do	1¾	do 3..	do 23..	do 27..	117	4 6	37 30	61½

TEST OF LAND TREATED WITH SUPERPHOSPHATE OF LIME AND FIELD LIME.

In this test three plots of $\frac{1}{10}$th acre each were sown with Red Fife at the rate of 1½ bushels per acre. On one plot 50 pounds of superphosphate of lime was sown; a second plot had 60 pounds of field lime (air slacked) sown on it, and the third plot was untreated.

The plot on which field lime was used gave at the rate of 4 bushels per acre more than either of the other two. The superphosphate of lime plot was one day earlier in ripening.

The details of the test are as follows:—

Name of Variety.	Treatment per acre.	Sown.	Headed.	Ripe.	Matured in.	Height.	Yield per acre.	Weight per bush.
					Days.	Ft. in.	Bus. lbs.	Lbs.
Red Fife...	500 lbs.—Sup. ph. lime.....	May 4..	July 22..	Aug. 26.	115	4 6	36 ..	61
do	600 lbs.—field lime.........	do 4..	do 21..	do 27..	116	4 6	40 50	62½
do	Untreated................	do 4..	do 21..	do 27..	116	4 6	36 20	60½

TEST OF BROADCAST, DRILL AND PRESS-DRILL SOWING.

Red Fife was used also in this test and the three plots were sown on the same date. The broad-cast plot was so much injured by winds that it was ploughed up and re-sown on 29th May.

Name of Variety.	How Sown.	Sown.	Headed.	Ripe.	Matured in.	Height.	Yield per acre.	Weight per bush.
					Days.	Ft. in.	Bus. lbs.	Lbs.
Red Fife...	*Broadcast..................	May 29..	Aug. 2..	Aug. 29..	93	4 6	25 40	60
do	Drill....................	do 4..	July 23..	do 28..	117	4 8	36 18	62½
do	Press-drill..................	do 4..	do 21..	do 26..	115	5 ..	38 20	62½

*Re-sown May 29th.

TEST OF STUBBLE FALL PLOUGHED, SPRING PLOUGHED, WITHOUT PLOUGHING AND FALLOWED LAND.

In this test two acres of stubble land was ploughed in the fall of 1892, two acres of stubble ploughed with a gang plough at the time of seeding, two acres of stubble land sown by press drill without ploughing and not touched before or after using drill, and two acres of fallow were sown. The stubble in all cases had been fallowed in summer of 1891 and had produced a crop of Red Fife in 1892.

The fallow land gave much the better result, and the fall ploughing the result expected, and the result that has always been had in our experience, a much smaller crop no matter how well the work may be done. Spring-ploughing and the plot sown by the press-drill without ploughing, gave a fine crop of straw and a good yield of grain, but the sample was shrunken.

TEST OF FALL AND SPRING PLOUGHING AND PRESS-DRILL ON STUBBLE COMPARED WITH SUMMER FALLOW.

Name of Variety.	Mode of Cultivation.	Sown.	Headed.	Ripe.	Matured in.	Height.	Condition.	Yield per acre.	Weight per bush.
					Days.	Ft. in.		Bus. lbs.	Lbs.
Red Fife..	Fall ploughing; stubble..	May 2..	July 15.	Aug. 21..	112	4 4	Light...	22 10	59
do ..	Spring do do ..	do 2..	do 18.	do 23..	114	4 6	Medium	31 30	60
do ..	Press-drill; stubble......	do 2..	do 15.	do 21..	112	4 6	Medium	29 50	59½
do ..	Fallow.................	do 3..	do 21.	do 23..	113	4 7	Good...	37 50	60

SMUT TESTS.

Two kinds of seed were used in these tests; one badly affected by smut and the other almost entirely free from it.

The same treatment was given in each case namely, one pound of bluestone in one and one half pails of water to 5, 7 and 10 bushels wheat; all mixed on the barnfloor and turned over several times. The heads were counted on six feet square in each plot.

RESULTS OF SOWING SMUTTY WHEAT, TREATED AND UNTREATED.

Name of Variety.	Treatment.	Sown.	Headed.	Ripe.	Good heads.	Smutty heads.	Yield per acre.	Weight per bush.
Seed badly affected.							Bus. lbs.	Lbs.
Red Fife................	Untreated............	May 4..	July 23.	Aug. 29.	1,452	251	24 10	57½
do	1 lb. to 10 bush......	do 4..	do 23.	do 27.	1,648	8	34 20	59½
do	1 lb. to 7 bush......	do 4..	do 23.	do 27.	1,760	9	33 50	60½
do	1 lb. to 5 bush....	do 4..	do 23.	do 27.	1,590	6	31 20	61½
Seed not badly affected.								
Red Fife.............	Untreated	do 4..	do 23.	do 26.	1,480	28	28 10	60½
do	1 lb. to 10 bush......	do 4..	do 23.	do 26.	1,536	3	28 20	60½
do	1 lb. to 7 bush......	do 4..	do 23.	do 26.	1,700	2	30 30	60
do	1 lb. to 5 bush......	do 4.	do 23.	do 26.	Record lost.		29 ..	60

CROSS-BRED WHEATS.

The result of the tests of the cross-bred wheats during the past season, was not very satisfactory. All gave a large quantity of straw and there were fair yields of nearly all the sorts tried, but the grain was poor except in two cases and these were not equal to Red Fife. This was caused to a great extent, no doubt, by the hot winds of August 6th, as other varieties sown alongside the cross-bred sorts were, with few exceptions as badly hurt.

Stanley and Alpha, beardless sorts, give promise of being the most valuable of all thus far tested. These two gave 35·10 and 32·10 respectively per acre, of fairly good grain and were 4 and 5 days earlier than Red Fife sown alongside for comparison. The results of a test of 12 varieties of these cross-bred wheats sown on $\frac{1}{10}$th acre plots have been given and the yields of 9 varieties which were sown on acre plots will be found below. The small plots are of new sorts, tested here for the first time, and have occupied too small an area to admit of a satisfactory calculation as to yield per acre.

TESTS OF CROSS-BRED WHEATS ON ONE ACRE PLOTS.

Name of Variety.	Cross between	Sown.	Headed.	Ripe.	Matured in.	Height.	Yield per Acre.	Weight per Bushel.
					Days.	Ft.	Bush.	Lbs.
Abundance........	Ladoga and Red Fife..	May 2.	July 21.	Aug. 19.	110	4·7	24·	56½
Carleton..........	do do ..	do 2.	do 19.	do 19.	110	4·7	37·15	58
Ottawa...........	do do ..	do 2.	do 19.	do 19.	110	4·7	20·	56½
Stonewall.........	do do ..	do 2.	do 19.	do 18.	109	4·7	22·24	57½
Trial........	do do ..	do 2.	do 19.	do 18.	109	4·7	27·15	60
Advance........	Ladoga and White Fife	do 2.	do 19.	do 20.	111	4·7	28·9	59
Manifold.........	do do ..	do 2.	do 23.	do 20.	111	4·6	31·20	59½
Albert	Ladoga and Red Fife..	do 2.	do 18.	do 18.	109	4·7	25·27	57
A. No. 1..........	do do ..	do 2.	do 15.	do 15.	106	4·7	30·40	58½

SMALL PLOTS.

New Hybrids.....	Red Fife and Club Bombay.	May 4.	July 21.	Aug. 22.	111	4·6	Plot small and no yield taken.
	Red Fife and Ladoga..	do 4.	do 22.	do 23.	112	4·6	do
	Anglo-Canadian and Karachi.	do 4.	do 12.	do 24.	113	4·7	do
	Red Fife and Ladoga (Red Chaff.)	do 4.	do 21.	do 23.	112	4·7	do
	Spiti Valley and Red Fife (beardless.)	do 4.	do 10.	do 22.	111	4·7	do

GENERAL RESULT OF WHEAT TESTS FOR 1893.

On account of there being no spring or fall frosts to injure any of the varieties of wheat tested, it may safely be said that Red Fife has given the best results in every respect.

The result of the wheat tests, on the whole, the past season, has not been altogether satisfactory. While the crop of straw in all the varieties was large, the hot winds in August injured the grain in all the late kinds considerably, and caused it to ripen prematurely, but early sorts, such as the Gehun, which were well advanced before the hot winds came suffered less. The result of the injury is not so much observed in the yield as in the weight and quality of the grain.

As to earliness, all the sorts matured in much less time than in 1892. Red Fife in 1892 took 139 days to mature; this year 115 days; Gehun, in 1892 took 121 days; this year 108 days.

BARLEY.

Twenty-five varieties of barley were tested the past season. Of these, 17 were old sorts and 8 new hybrids between six-rowed and two-rowed barley which have been produced at the Central Experimental Farm. Five varieties yielded over 50 bushels per acre, 8 over 40 bushels and the remainder over 30 bushels.

All kinds were very heavy in the straw but the grain was light in weight caused by the hot winds ripening it too quickly. Except two varieties and in a few others in low places no lodging took place. The straw, as will be seen, was from 3 to 4½ feet in length, and some kinds went over 400 pounds to the $\frac{1}{10}$th acre.

Except a few acres sown on stubble land, all the barley was put in on fallow and unless otherwise stated, 2 bushels of seed were sown per acre.

Sixteen varieties sown on the same day, under the same conditions, matured on an average in 95 days, while last year, 13 kinds under the same conditions, took an average of 120 days to ripen. The weather during the barley harvest was fine and all sorts were secured without being weather-stained.

FIELD LOTS.—PLOTS OF FOUR ACRES AND UPWARDS.

Five varieties were sown in fields, all of these were two-rowed, and one of them California Prolific was sown on three different dates.

All sorts were very heavy in the straw, but all, excepting Prize Prolific and Newton, stood up and were easily harvested. One field of California Prolific of 5 acres, yielded 57 bushels 44 pounds per acre, from the thresher. The grain of all the varieties is much lighter than usual.

RESULTS OF FIELD CROPS OF TWO-ROWED BARLEY.

Name of Variety.	Sown.	Headed.	Ripe.	Matured in.	Height.		Character of Straw.	Yield per Acre.		Weight per Bushel.
				Days.	Ft.	in.		Bush.	lbs.	Lbs.
California Prolific...	May 6	July 18	Aug. 12	98	4	6	Strong & fine.	45	..	49
do ...	do 8	do 17	do 11	95	4	6	Strong & fine.	57	44	49
do ...	do 9	do 20	do 14	97	4	0	Strong.	48	2	48
do fall pl'h'ng	do 11	do 17	do 12	93	3	9	Strong.	41	32	47
Newton............	do 12	do 19	do 16	96	3	0	Weak.	39	17	46½
Kinver Chevalier....	do 9	do 20	do 18	101	3	0	Weak.	47	60	47
Prize Prolific........	do 9	do 20	do 18	101	3	9	Weak.	40	..	47
Goldthorpe..........	do 11	do 21	do 17	98	3	6	Weak.		Not	threshed

RESULTS OF SOWING BARLEY AT DIFFERENT DATES ON ONE-TENTH ACRE PLOTS.

In this test Duckbill, a two-rowed variety, and Baxter's six-rowed were used. The first plots were sown on 24th April and the last on 29th May, with a week intervening between each set of plots.

The plots sown on 1st and 8th May gave the best returns. The three last plots in both sorts gave a smaller yield per acre and lower weights per bushel than the first three sown, caused probably by the hot wind on August 6th, catching these

plots while in the milk stage and hastening their ripening. All the plots were heavy in straw excepting those of the last seeding.

Name of Variety.	Sown.		Headed.		Ripe.		Matured in.	Height.		Weight of Straw.	Yield per Acre.		Weight per Bushel
							Days.	Ft.	in.	Lbs.	Bush.	lbs.	Lbs.
Duckbill..............	April	24	July	18	Aug.	12	111	4	0	222	35	..	48½
do	May	1	do	19	do	12	104	4	0	248	43	6	50
do	do	8	do	21	do	14	99	4	0	273	42	4	50
do	do	15	do	21	do	15	93	4	0	263	37	44	49
do	do	22	do	22	do	17	88	4	0	193	32	34	46
do	do	29	do	26	do	19	83	3	10	144	26	12	44
Baxter's 6-rowed.......	April	24	do	10	do	8	107	3	6	233	36	42	51
do	May	1	do	12	do	8	100	3	6	406	42	24	50½
do	do	8	do	13	do	9	94	3	6	368	40	..	50
do	do	15	do	15	do	12	90	3	6	280	30	10	50½
do	do	22	do	18	do	14	85	3	6	276	30	..	46½
do	do	29	do	20	do	16	80	3	2	249	31	22	49

TEST OF VARIETIES ALL SOWN SAME DATE, ONE-TENTH ACRE PLOTS.

Sixteen varieties were sown in this test. The soil was sandy loam uniform in character and had been fallowed the preceding year. Two bushels of seed per acre was sown by drill. In earliness the six-rowed matured in from 6 to 11 days less time than the two-rowed. All sorts produced a good crop of straw, some very heavy and all stood up well.

Name of Variety.	Sown.		Headed.		Ripe.		Matured in.	Height.		Weight of Straw.	Character of Straw.	Yield per Acre.		Weight per Bushel.
							Days.	Ft.	in.	Lbs.		Bush.	lbs.	Lbs.
Six-rowed sorts—														
Baxter's..............	May	10	July	12	Aug.	8	90	3	6	333	Fair...	36	42	50
Common............	do	10	do	9	do	8	90	4	0	169	Weak..	36	42	51½
Rennie's Improved..	do	10	do	12	do	12	94	4	0	298	Fair...	49	18	50
Odessa............	do	10	do	10	do	12	94	3	6	171	do	49	38	49½
Petschora...........	do	10	do	10	do	8	90	4	6	246	do	37	14	46
Guymalaye..........	do	10	do	17	do	14	96	3	6	263	do	41	2	59
Oderbruch..........	do	10	do	9	do	8	90	3	6	268	do	42	4	52½
Mensury............	do	10	do	11	do	8	90	4	0	307	do	38	16	46
Two-rowed sorts—														
Prize Prolific........	do	10	do	19	do	19	101	3	6	338	Weak..	44	2	48
Danish Chevalier...	do	10	do	21	do	19	101	3	6	353	Strong..	54	28	51½
Goldthorpe..........	do	10	do	17	do	18	100	3	6	258	Weak..	48	46	49
Canadian Thorpe....	do	10	do	17	do	14	96	4	3	155	Strong..	43	36	49
Improved Chevalier.	do	10	do	17	do	18	100	3	6	438	do ..	42	4	51
Duckbill..........	do	10	do	17	do	16	98	4	3	233	do ..	50	20	50
Thanet......	do	10	do	18	do	19	101	4	0	368	Weak..	51	22	49
Kinver Chevalier....	do	10	do	18	do	18	100	4	0	358	do ..	54	38	48

TEST OF BROADCAST, PRESS DRILL AND ORDINARY DRILL.

In this test California Prolific was used. The soil, was a heavy clay loam which was fallowed the preceding year, and the seed was sown at the rate of two bushels per acre.

That put in by the Press-drill gave seven bushels more than that sown by the common drill, and 9 bushels and 28 pounds more than the plot sown

with the broadcast seeder. The straw was longer where the press-drill was used and the grain ripened 3 days in advance of either of the other two.

Name of Variety.	Sown.	Headed.	Ripe.	Matured in.	Height.	Weight of Straw.	Yield per Acre.	Weight per Bushel
				Days.	Ft. in.	Lbs.	Bush. lbs.	Lbs.
California Prolific, press-drill.	May 8	July 20	Aug. 19	104	4 8	226	55 ..	49
do common drill....	do 8	do 20	do 18	101	4 6	163	48 ..	48
do broadcast seeder..	do 8	do 23	do 19	104	4 6	182	45 20	47½

TEST OF STUBBLE *VS.* FALLOW.

In this test four acres of stubble were ploughed in the fall of 1892 and four acres fallowed during the same year. Two bushels per acre of California Prolific Barley were sown by drill. The stubble land used was in rather a low place and was situated alongside of a railway embankment, both of which helped the grain when the hot winds came. The embankment especially breaking the force of the hot blasts as they passed over.

Name of Variety.	Land.	Sown.	Headed.	Ripe.	Matured in.	Height.	Yield per Acre.	Weight per Bushel.
					Days.	Ft. in.	Bush. lbs	Lbs.
California Prolific .	Fallow	May 9..	July 20.	Aug. 14.	98	4 2	48 10	48
do ..	Fall ploughing of stubble.................	do 9..	do 17.	do 12.	96	4 1	41 32	47

TEST OF SOWING DIFFERENT QUANTITIES OF SEED PER ACRE—ONE-TENTH ACRE PLOTS

In these experiments California Prolific was again used. The soil was a heavy clay loam, which had been fallowed and was in good order. Two bushels per acre gave the best return, and the crop matured in two days less time than either 1¾ or 1½ bushels.

Name of Variety.	Quantity of Seed per Acre.	Sown.	Headed.	Ripe.	Matured in.	Height.	Weight of Grain and Straw.	Yield per Acre.	Weight per Bnshel.
	Bush.				Days.	Ft. in.	Lbs.	Bush. lbs.	Lbs.
California Prolific.......	2	May 8	July 20.	Aug. 14.	99	4 3	308	48 14	48½
do	1¾	do 8	do 20.	do 16.	101	4 3	316	44 28	49
do	1½	do 8	do 20.	do 16.	101	4 4	229	43 44	47

NEW HYBRID BARLEYS.

Two named and six unnamed hybrids were tested in the small plots. All are crosses between Swedish two-rowed female and Baxter's six-rowed male, recently produced at the Central Experimental Farm, but are of different types.

Name of Variety.	Cross between	Sown.	Headed.	Ripe.	Matured.	Yield per Acre.	Weight per Bushel.
					Days.	Bush. lbs.	Lbs.
Surprise	Swedish and Baxter's 6-rd..	May 15.	July 15.	Aug. 14.	91	39 ..	48
Summit	do ..	do 15.	do 17.	do 15.	92	40 32	46
Type D	do ..	do 12.	do 10.	do 11.	91	....	48½
do P	do ..	do 12.	do 12.	do 14.	94	Not threshed.	
Type A	do ..	do 12.	do 9.	do 11.	91	....	47½
do 11	do ..	do 12.	do 10.	do 14.	94	....	48
do S	do ..	do 12.	do 12.	do 14.	94	....	49½
do C	do ..	do 12.	do 11.	do 11.	91	....	47

OATS.

Forty varieties of oats were tested the past season; all being sown on fallowed land. All the varieties were very heavy in straw and gave good returns with the exception of one 5-acre block which was sown on fall ploughing, and although it gave a fair crop of straw the grain was of poor quality.

The best return was obtained from $\frac{1}{10}$th acre plot of American Banner, sown by press drill on 12th May, which gave 100 bushels per acre. A field of Prize Cluster, 15 acres in extent, produced 77·10 per acre and Welcome on a 5-acre plot alongside the Cluster yielded 78·18 per acre. The grain in both these cases was very good.

FIELD PLOTS.

Field plots of 15 acres down to 2 acres were sown on different dates. All were very heavy in straw but some of the plots lodged more or less and the grain in these was light.

The heaviest crop was that of the Welcome, mentioned above which gave 78 bushels 18 lbs. per acre. The soil, which was a sandy loam was fallowed, and the land gang-ploughed twice in 1892. Two and one-half bushels of seed was sown per acre and put in by drill.

TESTS OF FIELD PLOTS OF OATS.

Name of Variety.	Acres.	Sown.	Headed.	Ripe.	Matured in.	Height.	Yield per Acre.	Weight per Bush.
					Days.	Ft. in.	Bush.	Lbs.
Welcome	5	May 10..	July 18..	Aug. 15..	98	4 3	78 18	43
Banner	5	do 6..	do 20..	do 17..	104	4 6	67 00	36
Bonanza	2	do 6..	do 15..	do 12..	99	4 2	60 00	40
Cluster	15	do 8..	do 15..	do 11..	96	4 4	77 10	40
Blk. Champion	2	do 12..	do 19..	do 16..	97	4 0	36 14	36
White Russian	2	do 12..	do 18..	do 14..	95	4 2	48 19	39
Improved Ligowo	2	do 12..	do 16..	do 14..	95	4 0	49 10	40½
English White	2	do 12..	do 19..	do 16..	97	4 0	46 00	39
Winter Grey	2	do 12..	do 17 .	do 16..	97	4 4	50 31	40

RESULTS OF SOWING OATS AT DIFFERENT DATES, ONE-TENTH ACRE PLOTS.

Two varieties, Prize Cluster and American Banner, were chosen for this test and sown on fallowed land on April 24, and on the same day each week for six weeks ending May 29th. The quantity of seed used was 2½ bushels per acre which was sown by drill.

The first three dates of seeding gave the best results. The Cluster matured on an average 10 days earlier than the Banner but the latter produced the best crop. The following are the dates of seeding, yield, etc. :—

Name of Variety.	Sown.	Headed.	Ripe.	Matured in.	Height.	Yield per Acre.	Weight per Bush.
				Days.	Ft. in.	Bush. lbs.	Lbs.
Cluster	April 24	July 13	Aug. 7	106	4 4	72 2	40½
do	May 1	do 15	do 8	100	4 4	66 6	42
do	do 8	do 16	do 8	93	4 4	60 30	41½
do	do 15	do 21	do 14	92	4 5	56 10	41
do	do 22	do 23	do 19	90	4 5	58 20	41½
do	do 29	do 26	do 22	86	4 3	46 6	40
Banner	April 24	do 17	do 17	116	4 6	88 28	34½
do	May 1	do 18	do 19	111	4 6	76 20	33
do	do 8	do 19	do 21	106	4 6	86 6	34
do	do 15	do 21	do 22	100	4 6	87 12	34
do	do 22	do 23	do 24	95	4 5	63 00	32½
do	do 29	do 28	do 31	95	4 5	61 26	33½

TEST OF SOWING DIFFERENT VARIETIES ON SAME DATE, ONE-TENTH ACRE PLOTS.

Forty varieties were selected for this test. All were sown on the same day by drill at the rate of 2½ bushels per acre. The land was a uniform sandy loam which had been fallowed. The Welcome and Winter Gray were the first to ripen. These varieties matured in 92 days; while last year they took 127 and 134 days respectively to do so. Six kinds gave over 400 pounds of straw on the tenth acre plot, and one variety produced 520 pounds. The weight of the grain is lower this year than for the last two years, caused, no doubt, by the hot winds.

Name of Variety.	Sown.	Headed.	Ripe.	Matured in.	Height.	Weight of Straw.	Character of Straw.	Yield per Acre.	Weight per Bush.
				Days.	Ft. In.	Lbs.		Bush.	Lbs.
Cluster	May 9	July 13.	Aug. 10.	94	4 6	423	Heavy	64·00	41
Welcome	do 9	do 12.	do 8.	92	4 6	383	do	78·18	42
Winter Gray	do 9	do 13.	do 8.	92	4 6	520	do	82·12	40½
Bonanza	do 9	do 10.	do 7.	91	4 6	355	do	66·16	41½
Improved Ligowo	do 9	do 10.	do 16.	100	4 3	300	Stiff	79·14	40½
American Beauty	do 9	do 16.	do 17.	101	3 6	285	do	77·32	31
White Russian	do 9	do 17.	do 15.	99	4 0	336	do	60·00	36
Abundance	do 9	do 17.	do 16.	100	4 0	320	do	70·20	31½
Gothland	do 9	do 19	do 16.	100	4 6	422	do	76·00	39
English White	do 9	do 19.	do 19.	103	4 6	349	do	70·30	33½
Royal Doncaster	do 9	do 23.	do 20.	104	4 0	350	Straw very heavy	58·28	41
Giant Cluster	do 9	do 23.	do 27.	111	4 0	345	Stiff	65·20	32½
Archangel	do 9	do 13.	do 14.	98	5 0	365	do	70·20	32½
Cream Egyptian	do 9	do 15.	do 10.	94	4 6	477	do	74·14	40
White Wonder	do 9	do 15.	do 10.	94	4 6	390	do	55·20	40½
Columbus	do 9	do 17.	do 18.	102	4 0	220	do	58·28	31

TEST OF SOWING DIFFERENT VARIETIES OF OATS—*Con.*

Name of Variety.	Sown.	Headed.	Ripe.	Matured in.	Height.	Weight of Straw.	Character of Straw.	Yield per Acre.	Weight per Bush.
				Days.	Ft. in.	Lbs.		Bush.	Lbs.
Challenge	May 9	July 13	Aug. 14	98	4 6	226	Stiff	60·15	42
American Triumph	do 9	do 19	do 18	102	4 6	340	do	58·28	31½
Siberian	do 9	do 19	do 24	108	4 3	378	do	59·14	37
Abyssinia	do 9	do 19	do 19	103	4 3	370	do	67 22	30
Scottish Chief	do 9	do 16	do 14	98	4 3	383	do	64·24	44
Poland White	do 9	do 17	do 14	98	4 0	299	do	65·02	40½
Rennie's Prize White	do 9	do 16	do 14	98	4 0	149	do	73·28	42
Victoria Prize White	do 9	do 19	do 14	98	4 8	259	do	66·16	41
Golden Beauty	do 9	do 19	do 19	103	4 8	384	do	78·08	36
Oderbruch	do 9	do 19	do 20	104	4 6	373	Weak	72·22	39
Holstein Prolific	do 9	do 18	do 19	103	4 6	370	Stiff	82·12	37
Wide Awake	do 9	do 19	do 20	104	5 0	361	do	76·06	38
Cave	do 9	do 19	do 20	104	4 6	368	do	77·02	38
Flying Scotchman	do 9	do 16	do 14	98	4 3	352	Fair	64·04	37
Early Blossom	do 9	do 19	do 27	111	4 0	343	do	60·30	37½
Rosedale	do 9	do 19	do 18	102	4 6	455	do	70·20	31½
Banner	do 9	do 17	do 15	99	4 3	405	do	66·06	31
Imported Irish	do 9	do 17	do 14	98	4 8	318	do	54·04	42
Hazlett's Seizure	do 9	do 17	do 14	98	4 6	336	do	60·00	41
Black Tartarian	do 9	do 23	do 27	111	4 3	357	Heavy	56·26	37½
California Prolific Black	do 9	do 19	do 27	111	3 6	367	Weak	56·26	37
Black Couloummiers	do 9	do 19	do 27	111	3 8	499	do	50·10	38½
Early Etampes	do 9	do 16	do 20	104	3 6	384	do	57·22	35
Joanette	do 9	do 16	do 20	104	3 6	413	do	52·02	31½

TEST OF FALL PLOUGHING, SPRING PLOUGHING, WITHOUT PLOUGHING, AND FALLOW.

This test was made to find out the yield from these four methods of growing oats. The stubble land used had a crop of Red Fife in 1892 and was fallowed in 1891. Five acres were sown in each test.

The fall ploughing was done in October 1892. The stubble was turned under 6 inches deep and one stroke of the harrow was given in the spring. It was sown by drill without harrowing after and 2½ bushels of seed used per acre.

The spring ploughing was done by gang plough, 3 inches deep at time of seeding. The seed was first sown, then ploughed in and harrowed.

In the third way, the grain was sown by drill without either ploughing or harrowing.

The fallowed land was gang-ploughed twice and harrowed twice the preceding year and was sown by drill without harrowing.

Following will be found the results of tests in detail:—

Name of Variety.	Mode of Cultivation.	Sown.	Headed.	Ripe.	Matured in.	Height.	Yield per Acre.	Weight per Bushel.
					Days.	Ft. in.	Bush.	Lbs.
Welcome	Fall ploughing	May 13	July 18	Aug. 7	87	4 0	36	38½
do	Spring ploughing	do 13	do 15	do 7	87	4 2	66	40
do	Drill, without ploughing	do 13	do 15	do 8	88	4 2	62	40½
do	Fallow	do 10	do 18	do 15	97	4 6	78	43

TEST OF SEEDING, BROADCAST, DRILL AND PRESS-DRIL, ONE-TENTH ACRE PLOTS.

In this experiment the Banner oat was used. Two and one-half bushels per acre being sown in each case. The soil was a heavy clay loam.

The plot sown with press-drill ripened in 7 days less than that sown with the broadcast seeder and 1 day earlier than that sown with the common drill. The yress-drill gave 25 bushels per acre more than the broadcast seeding and 15 bushels more than the common drill.

Name of Variety.	Mode of seeding.	Sown.	Headed.	Ripe.	Matured in.	Height.	Yield per Acre.	Weight per Bushel.
					Days.	Ft. in.	Bus. lbs.	Lbs.
Banner.............	Broadcast.......	May 12	July 23	Aug. 25	106	4 3	75 20	37
do	Drill....	do 12	do 19	do 19	100	4 3	85 30	37½
do	Press-drill.............	do 12	do 18	do 18	99	4 6	100 ..	38

TEST OF SOWING AT DIFFERENT DEPTHS.

The Banner was used in this test also, the condition and character of soil being the same as in the previous test.

Name of variety.	Depth of Seeding.	Sown.	Headed.	Ripe.	Matured in.	Height.	Yield per Acre.	Weight per Bushel.
					Days.	Ft. in.	Bush.	Lbs.
Banner.	3 in. deep............	May 12.	July 21.	Aug. 23.	103	4 3	87·20	38
do	2 in. do	do 12.	do 20.	do 23.	103	4 3	81·26	36

TEST OF SOWING DIFFERENT QUANTITIES OF SEED PER ACRE.

In this test the conditions were the same except the quantity of seed sown. Two bushels per acre gave the best return.

Name of Variety.	Quantity of Seed per Acre.	Sown.	Headed.	Ripe.	Matured in.	Height.	Yield per Acre.	Weight per Bushel.
					Days.	Ft. in.	Bush.	Lbs.
Banner...........	2 bush. per acre.......	May 8.	July 18.	Aug. 17.	102	4 3	97·32	37
do	2½ do	do 8.	do 18.	do 18.	103	4 4	89·14	36½
do	2¾ do	do 8.	do 18.	do 18.	103	4 3	80·00	36½

TEST OF GROWING OATS WITH AND WITHOUT FERTILIZERS.

Three $\frac{1}{10}$th acre plots were sown with Banner Oats. On one plot 50 lbs. superphosphate of lime was sown; on the second, 60 lbs. field lime; and the third was untreated.

The plot with super-phosphate of lime gave 20 bushels per acre more than either of the other two, and ripened one day earlier. In this test in 1892, the super-phosphate of lime gave much the better result, but the untreated plot that season was badly injured by winds.

Name of Variety.	Treatment.	Sown.	Headed.	Ripe.	Matured in.	Height.	Yield per acre.	Weight per bushel.
					Days.	Ft. in.	Bush.	Lbs.
Banner	50 lbs. Super-phosph. lime	May 10	July 20	Aug. 21	104	4 4	85·20	36
do	60 " Field lime	do 10	do 21	do 23	106	4 4	65·20	35½
do	Untreated	do 10	do 21	do 22	105	4 4	65.20	37½

PEASE.

Twelve varieties were sown in $\frac{1}{10}$ acre plots and 7 of these in acre plots.

The crop of straw from all the sorts was heavy but the hot winds injured them so much that the yield was very small. Unfortunately a heavy wind storm took place immediately after the pease were pulled, which mixed the varieties so much that out of 19 plots, returns for only 6 kinds can be given, and they are not accurate for the reason that all the plots were badly threshed out by winds.

Two of the sorts that were badly mixed, Centennial and Potter, were the best of all varieties sown. The Pride also was of good quality.

ONE ACRE PLOTS OF PEASE.

Name of Variety.	Sown.	Blossomed	Ripe.	Matured in.	Yield per acre.	Weight per bushel.	Remarks.
				Days.	Bushels.	Lbs.	
Pride	May 5.	July 10.	Aug. 15	103	20·00	61	
White Marrowfat	do 5.	do 14.	do 23	111	14·10	63	
Black Eyed Marrowfat	do 5.	do 17.	do 23	111	11·40	61	
Mummy	do 5.	do 15.	do 16	104	16·40	62	
Prince Albert	do 5.	do 16.	do 22	110	....	....	Mixed by winds.
Crown	do 5.	do 16.	do 16	104	....	....	do do
Multiplier	do 5.	do 18.	do 17	105	9·01	62½	

ONE-TENTH ACRE PLOTS OF PEASE.

Name of Variety.	Sown.	Blossomed	Ripe.	Matured in.	Yield per Acre.	Condition.
				Days.	Bush. lbs.	
Mummy	May 10.	July 14.	Aug. 16.	99	....	Mixed by winds.
Black Eyed Marrowfat	do 10.	do 16.	do 23.	106	....	do do
Pride	do 10.	do 10.	do 14.	97	....	Very fine, mix. by w.
White Marrowfat	do 10.	do 18.	do 23.	106	....	Mixed by winds.
Multiplier	do 10.	do 18.	do 21.	104	....	do do
Prince Albert	do 10.	do 19.	do 21.	104	....	do do
Crown	do 10.	do 17.	do 16.	99	17·40	Small.
Potter	do 10.	do 16.	do 19.	102	....	Very fine, mix. by w.
Canadian Beauty	do 10.	do 18.	do 22.	105	....	Mixed by winds.
Centennial	do 10.	do 16.	do 17.	100	....	Extra fine, mix. by w.
Golden Vine	do 10.	do 17.	do 22.	105	....	Mixed by winds.
Prussian Blue	do 10.	do 19.	do 23.	106	....	do do

FODDER-MIXTURES AND FODDER PLANTS.

As in previous years a good deal of ground was given to fodder mixtures. These were sown on stubble land and on fallow and on account of the very favourable season a heavy rank crop resulted. A portion of the crop was made into hay, a part cut green and put in silo and the remainder cut on the green side and bound into sheaves to be cut with straw-cutter and fed to horses and stock.

In previous years the bulk of these mixtures was made into hay. Last year a test was made of allowing the mixture to partially mature, then cut with a binder and after curing in stook the mixture was cut during the winter with straw-cutter and fed to stock. This method having proved very satisfactory, the bulk of the mixtures this year after filling the silo was cured in this way.

Spring rye alone made the best hay. Oats and barley made the best fodder mixture, and pease, wheat and oats gave the heaviest crop.

The following tables give the results of the tests :

FIELD PLOTS.

Names of Grain.	Sown.	Headed.	Ripe.	Weight per Acre of Cured Hay.	Cut for Silo.	Weight per Acre of Ensilage.
				Tons. lbs.		Tons. lbs.
1 Oats and Barley	May 4	July 18	Aug. 14	3 1,560	Aug. 1	6 1,200
2 do Barley and Spring Rye	do 4	do 15	do 15	3 100	do 1	5 1,800
3 do on Spring Rye land	do 5	do 20	do 16	2 1,100	do 1	4 1,000
4 Spring Rye on Fallow	April 29	June 26	do 1	2 1,400	do 1	5 100

ONE-TENTH ACRE PLOTS.

Names of Grain.	Sown.	Headed.	Cut for Hay.	Weight per Acre of Cured Hay.
				Tons. lbs.
5 Golden Vine Pea, 6 lbs; Prize Prolific Barley, 5 lbs; Banner Oats, 3½ lbs	May 12	July 18	Aug. 4	3 500
6 Golden Vine Pea, 6 lbs; Red Fife Wheat, 5 lbs; Banner Oats, 3½ lbs	do 12	do 21	do 4	4
7 Extra Early Peas, 7 lbs; White Tares, 6 lbs	do 12	....	do 15	2 1,000
8 Duckbill Barley, 6 lbs; Spring Rye, 5 lbs	do 12	July 1	do 4	3 200
9 Oats and Spring Rye	do 12	do 1	....	3 800

In addition to grain mixtures corn, horse beans and sunflowers were also sown for fodder.

The corn although promising at first gave very poor returns when cut. Nine varieties were planted. All were further advanced than in any previous year, but none produced corn fully developed.

The nine sorts were planted in hills 3 feet apart each way and the same sown by grain drill in rows 3 feet apart on fallowed land which was ploughed and harrowed before the seed was put in. All were put in the same day and the results show but little difference between the returns from the hill and drill planting.

One variety, North Dakota, was sown on potato land that had been well manured before potatoes were planted in 1893. This gave 8 tons 280 pounds per acre.

RESULTS OF TESTS OF VARIETIES OF CORN.

Name of Variety.	Planted or Sown.	Tasselled.	Cut.	Weight per Acre. Tons.	lbs.
Planted in Hills, 3 ft. each way—					
North Dakota	May 26	Aug. 10	Aug. 28	4	1,900
Pearce's Prolific	do 26	do 10	do 28	4	1,020
Mastodon Dent	do 26	do 18	do 28	5	1,000
Rural Thoro'bred White Flint	do 26	do 16	do 28	4	1,350
Angel of Midnight	do 26	do 10	do 28	5	780
Compton's Early	do 26	do 2	do 28	5	1,000
Golden Dew Drop	do 26	do 6	do 28	5	450
Mitchell's Extra Early	do 26	do 8	do 28	4	1,680
Smut-nose Flint	do 26	do 8	do 28	4	1,900
Sown by Drill in rows, 3 ft. apart—					
North Dakota	do 26	do 10	do 28	5	340
Pearce's Prolific	do 26	do 10	do 28	4	1,900
Mastodon Dent	do 26	do 18	do 28	4	1,580
Rural Thoro'bred White Flint	do 26	do 16	do 28	4	1,900
Angel of Midnight	do 26	do 10	do 28	5	1,110
Compton's Early	do 26	do 2	do 28	5	1,000
Golden Dew Drop	do 26	do 6	do 28	5	1,200
Mitchell's Extra Early	do 26	do 8	do 28	4	1,080
Smut-nose Flint	do 26	do 8	do 28	5	1,770
Planted on Potato Ground of 1892—					
North Dakota	do 26	do 10	do 28	8	280

The horse-beans fully matured and were a fair crop. They were cut up along with the corn and put in the silo.

Between two and three acres of sunflowers were sown for the purpose of putting the heads along with the corn and beans in the silo. On account of taking longer to develop their seed, they were not far enough advanced when the corn and beans were ready and the frost killed them when only a small percentage of the heads were filled. The seed was probably put in too late, it will be sown earlier next year.

GRASSES.

In the spring of 1892, sixteen varieties of grass were sown in plots, and mixtures of these with native grasses were sown in the field with barley.

Most of the field plots were blown out and the balance killed by dry weather after the seed came up. Out of the sixteen sorts sown only two produced a crop the past season. They were Bromus Inermis and Muhlenbergia Sylvatica. The former gave a yield of 3 tons 1,200 pounds per acre, and the latter ¾ of a ton per acre.

As Bromus Inermis had stood two winters and each year given a good crop, and believing that it will be a very valuable hay for the North-west, a quantity of seed was procured and fifteen acres sown with it last spring, to which large additions will be made in the spring of 1894.

This grass has the advantage of starting to grow almost as soon as the snow is gone, and before a green blade is seen on the prairie or in any of the cultivated sorts, the Bromus Inermis is six inches high. In addition to this good feature, it appears to stand the winters and spring frosts to perfection ; at least it has done so for the last two years, and although this may not be long enough to establish a claim to absolute hardiness for years to come, it may safely be recommended as the best and surest grass so far tested on the experimental farm. Good points also in its favour are the ease with which a good catch can be obtained, and its ability to endure our dry warm months.

SPRING RYE.

Five acres of spring rye were sown for seed on April 29th. It came into head on June 26th, and ripened August 8th. Two acres were cut for hay on August 1st and the remaining three acres yielded 16½ bushels per acre.

FLAX.

Two plots of flax were sown on May 30th, which ripened on August 31st. The straw was short and the yield of both seed and straw small.

ROOTS.

The past season has been one of the worst since the farm was started, for field roots. All varieties tested made a good beginning, but on account of injury from a heavy wind soon after the young plants were thinned and a prolonged drought after the middle of July, the returns were small. All roots were sown on fallow land, which was ploughed and harrowed before sowing.

TURNIPS.

Twelve varieties were tested. The first seeding was done on 25th May, and the 12 sorts were again sown on 6th June. As will be seen, the first seeding gave the best returns.

Name of Variety.	Sown.	Pulled.	Yield per Acre.	
First Seeding.			Bush.	lbs.
Carter's Elephant	May 25..	Oct. 9..	623	20
Prize Winner	do 25..	do 9..	660	..
Rennie's Purple Top	do 25..	do 9..	407	..
Marquis of Lorne	do 25..	do 9..	322	30
Jumbo	do 25..	do 9..	476	40
Skirving's Purple Top	do 25..	do 9..	236	30
Monarch	do 25..	do 9..	472	40
Sutton's Champion	do 25..	do 9..	396	..
Mammoth Purple Top	do 25..	do 9..	375	50
Bangholm do	do 25..	do 9..	403	20
Selected Purple Top	do 25..	do 9..	491	20
East Lothian	do 25..	do 9..	386	50
Second Seeding.				
Carter's Elephant	June 6..	Oct. 9..	172	30
Prize Winner	do 6..	do 9..	318	20
Rennie's Purple Top	do 6..	do 9..	227	20
Marquis of Lorne	do 6..	do 9..	243	50
Jumbo	do 6..	do 9..	330	..
Skirving's Purple Top	do 6..	do 9..	304	20
Monarch	do 6..	do 9..	282	20
Sutton's Champion	do 6..	do 9..	280	30
Mammoth Purple Top	do 6..	do 9..	221	50
Bangholm	do 6..	do 9..	320	50
Selected Purple Top	do 6..	do 9..	335	30
East Lothian	do 6..	do 9..	289	40

MANGELS.

Ten sorts of mangels were tested. Like the turnips they were sown on different dates, May 25 and June 6. The early seeding proved to be the best. Heavy frost in the latter part of September and early in October almost spoiled the crop.

Name of Variety.	Sown.	Pulled.	Yield per Acre.	
First Seeding.			Bush.	lbs.
Erfurt Model	May 25	Oct. 9	201	40
Gate Post	do 25	do 9	271	20
Canadian Giant	do 25	do 9	265	50
Orange Giant	do 25	do 9	193	30
Yellow Globe	do 25	do 9	282	10
Golden Tankard	do 25	do 9	165	..
Giant Yellow (intermediate)	do 25	do 9	256	40
Red-fleshed Tankard	do 25	do 9	348	20
Red Globe	do 25	do 9	238	20
Mammoth Globe	do 25	do 9	267	40
Second Seeding.				
Erfurt Model	June 6	Oct. 9	165	..
Gate Post	do 6	do 9	183	20
Canadian Giant	do 6	do 9	183	.
Orange Giant	do 6	do 9	146	40
Yellow Globe	do 6	do 9	192	30
Golden Tankard	do 6	do 9	135	40
Giant Yellow (intermediate)	do 6	do 9	172	20
Red Fleshed Tankard	do 6	do 9	181	30
Red Globe	do 6	do 9	146	40
Mammoth Globe	do 6	do 9	187	..

CARROTS.

Nine varieties were sown on two different dates, May 25 and June 6, but no variety on either date of seeding gave a crop worth taking up.

SUGAR BEETS.

Four varieties were tested, but late frosts injured them all. The earliest sowing gave the best results.

Name of Variety.	Sown.	Pulled.	Yield per acre.	
First Seeding.			Bush.	lbs.
French	May 25	Oct. 9	275	..
Klein Wanzleben	do 25	do 9	225	..
White Improved	do 25	do 9	192	30
Green Top Brabant	do 25	do 9	311	50
Second Seeding.				
French	June 6	Oct. 9	183	20
Klein Wanzleben	do 6	do 9	165	..
White Improved	do 6	do 9	132	..
Green Top Brabant	do 6	do 9	196	30

POTATOES.

Thirty-four varieties were tested and like the roots were the poorest crop we have had since the farm was established. Besides being light in yield, they were small in size, scabby and only fair in quality. The potato land was fallowed in 1892, ploughed before planting and well harrowed. The potatoes were dropped in rows 3 feet apart and 13 inches in the rows, harrowed after they came up and were run through with a scuffler each week. When tops got large enough they were hilled up with a plough.

Planted 26th May; taken up 5th Oct.

Name of Variety.	Yield per Acre.		Name of Variety.	Yield per Acre.	
	Bush.	lbs.		Bush.	lbs.
Crown Jewel	133	30	Early Sunrise	183	20
Empire State	91	40	Holborn Abundance	165	..
Thorburn	67	50	Northern Spy	150	20
Sharpe's Seedling	128	20	Dakota Red	155	50
Algoma No. 1	100	50	State of Maine	73	20
Early Ohio	91	40	Burpee's Extra Early	132	20
Early Rose	152	10	Polaris	152	10
Early Puritan	128	20	Green Mountain	124	20
Chicago Market	141	20	White Beauty	141	20
Beauty of Hebron	163	10	New Variety	146	40
Rural Blush	128	20	Pearce's Extra Early	143	..
Delaware	183	20	Toronto Queen	139	20
Lee's Favourite	124	40	Earliest of All	73	20
Vanguard	137	30	American Giant	135	40
Clarke's No. 1	165	..	Munroe Co.	205	..
Everett	183	20	Early Gem	139	20
Daisy	157	40	Sunlit Star	128	20

VEGETABLE GARDEN.

As in preceding years, tests were made with several sorts of many kinds of vegetables to find out the earliest and best for the North-west.

No special effort was made to produce large specimens or heavy crops, earliness and suitability being the main object. On account of protection afforded by the wind breaks, now established on the farm, the crop on the whole was the best and most satisfactory of any yet grown. This was especially the case with the onion crop.

ARTICHOKES

Did not do well. The tops grew to a good size but were hurt by frost in September and the bulbs were small.

Sown, 4th May; up, 22nd May.

ASPARAGUS.

The first cutting was had on May 27. It did well and gave a large crop all through the season.

BEANS.

Nine varieties were planted. The two best were Dwarf German White Wax and Wardell's Kidney. These with Yellow Six-weeks and White Kidney were the only ones that matured.

Name of Variety.	Sown.	Up.	Fit for use.	Remarks.
Lazy Wives	May 17	May 31	July —	No good. Did not pod.
Mammoth Red German Wax	do 17	do 31	do 28	Good.
Crystal White Wax	do 17	do 31	do 28	Very good.
Dwarf German White Wax	do 17	do 31	do 28	do
Wardell's Kidney	do 17	do 31	do 28	Fair.
Dwarf Triumph	do 17	do 31	do 28	Small.
Mohawk	do 17	do 31	do 7	Good.
Yellow Six-Weeks	do 17	do 31	do 7	do Ripened.
White Kidney	do 17	do 31	do 7	do do

BEETS.

Seven sorts were sown. All did well, but Edmonds Early and Black Knight were the best for the table.

The seven kinds were also transplanted. When so treated they grew larger than those left in the beds where sown, but were not fit for table use.

Name of Variety.	Sown.	Up.	Fit for use.	Lifted.	Bushels per acre.	Remarks.
Early Blood Turnip	May 15.	June 3.	Aug. 15.	Sept. 22.	701	Good shape; light colour.
Edmund's Early	do 15.	do 3.	do 15.	do 22.	484	Extra good.
Rennie's Intermediate	do 15.	do 3.	do 15.	do 22.	666	Good shape.
Eclipse	do 15.	do 3.	do 15.	do 22.	726	Very good.
Arlington	do 15.	do 3.	do 15.	do 22.	556	do
Long Dark Red	do 15.	do 3.	do 15.	do 22.	635	do
Black Knight	do 15.	do 3.	do 15.	do 22.	302	Small; good colour.

CAULIFLOWERS.

Twenty-two varieties were tested and a great difference in value was noted. Giant White Pearl and Thorburn's Large Early Dwarf Erfurt, Early Snowball and Gilt Edged Snowball being the best. Some others were as early but the flowers were small and open. Short Stemmed La Normande made large flowers but the colour was bad. All the late varieties gave good promise, but were destroyed by frost in September when beginning to make head.

CAULIFLOWERS.

Name of Variety.	Sown in Hot-bed	Up.	Trans-planted in Hot-bed.	Trans-planted in open Ground.	Fit for use.	Remarks.
Large Late Mammoth......	April 11	April 15	April 25..	May 29..	July 7	Small.
Veitch's Autumn Giant	do 11	do 16	do 25..	do 29..	Aug. 20	Hurt by frost.
Early Snowball....	do 11	do 16	do 21..	do 29..	July 14	Very good.
Gilt Edge Snowball.	do 11	do 16	do 21..	do 29..	do 14	do
Ex. Ey. Dwarf Erfurt	do 11	do 16	do 21..	do 29..	do 15	Small.
Nonpareil....................	do 11	do 16	do 21..	do 29..	....	No good.
Early Paris..................	do 11	do 16	do 21..	do 29..	....	do
Early Walcheren............	do 11	do 16	do 21..	do 29..	....	do
Extra Dwarf Erfurt.........	do 11	do 16	do 21..	do 29..	July 14	Very good.
Large Ey. Dwarf Erfurt.....	do 11	do 16	do 21..	do 29..	do 14	The best.
Half Ey. Dwarf French......	do 11	do 16	do 21..	do 29..	do 7	Very poor.
Large Algiers......	do 11	do 16	do 21..	do 29..	Aug. 10	Hurt by frost.
Italian Taranto..	do 11	do 16	do 21..	do 29..	do 12	Poor.
Large Early London	do 11	do 16	do 21..	do 29..	....	No good.
Stadtholder.............. .	do 11	do 16	....	....	....	Very poor and not put out.
Autumn Giant...	do 11	do 16	April 25..	April 29..	Aug. 20	Hurt by frost.
Short Stemmed La Normand.	do 11	do 16	do 25..	do 29..	do 8	Fair.
Gilt Edge.........	do 11	do 16	do 25..	do 29..	July 7	Very fine.
Imp. Earliest Dwarf Erfurt..	do 11	do 16	do 25..	do 29..	do 7	Small.
Early German Erfurt........	do 11	do 16	do 21..	do 29..	do 7	do
Giant White Pearl....	do 11	do 16	do 25..	do 29..	do 7	Very fine.
Ex. Ey. White Heads.......	do 11	do 16	do 25..	do 29..	do 11	do

CABBAGE.

Twelve varieties were planted and all did well.

The Jersey Wakefield, Express and Henley's Champion were the earliest but were small. Burpee's All Head was the best cabbage this season. Early Summer, Surehead and Vandergraw being next.

Name of Variety.	Sown in Hotbed.	Up.	Trans-planted in Hotbed.	Trans-planted in Open Ground.	Fit for Use.	Taken up.
Burpee's All Head....	April 10..	April 14..	April 26..	May 29..	July 28..	Sept. 16..
New World Beater	do 10..	do 14..	do 26..	do 27..	Aug. 27..	do 16..
Henderson's Early Summer	do 10..	do 14..	do 26..	do 27..	July 28..	do 16..
Bridgeport Drumhead.	do 10..	do 14..	do 26..	do 27..	do 27..	do 16..
Imp. Jersey Wakefield	do 10..	do 14..	do 26..	do 29..	do 14..	do 16..
Imp. Am. Dun. Savoy.............. .	do 10..	do 14..	do 26..	do 29..	Aug. 27..	do 16..
Mam. Red Rock......................	do 10..	do 14..	do 26..	do 29..	do 27..	do 16..
Henley's Champion................ ..	do 19..	do 23..	May 5..	do 29..	July 14..	do 16..
Express	do 19..	do 23..	do 5..	do 29..	do 14..	do 16..
Vandergraw........	do 19..	do 23..	do 5..	do 29..	Aug. 27..	do 16..
Filderkraut	do 19..	do 23..	do 5..	do 29..	do 27..	do 16..
Surehead............................	do 10..	do 14..	April 26..	do 27..	do 27..	do 16..

CUCUMBERS.

Four varieties of cucumbers were sown in pots in a hotbed on April 16th, and transplanted into frames in the garden on May 26th.

They gave a large crop. New Siberian is small but much the most prolific. Giant Pera is a good bearer and very large and well shaped. White Pearl is a poor producer but the pure white cucumber is very handsome and fine flavoured.

Those sown in the garden without any protection immediately about them did not produce as abundantly and were not so early.

SOWN IN POTS IN HOT-BED.

Name of Variety.	Sown in Hot-Bed.	Up.	Trans-planted in open.	Fit for use.	Ripe.
Giant Pera	Apr. 16	Apr. 22	May 26	June 22	....
New Siberian	do 16	do 22	do 26	do 20	Aug. 11
Burpee's White Pearl	do 16	do 22	do 26	do 22	....
White Spine	do 16	do 22	do 26	do 26	....

CUCUMBERS SOWN IN OPEN GROUND.

Name of Variety.	Sown.	Up.	Fit for use.
New Paris Pickling	Apr. 26	May 31	Aug. 29
Giant Pera	do 26	do 31	do 29
New Siberian	do 26	do 31	do 29

CELERY.

Eight varieties were tested. None of the sorts did as well as last year. Giant White, London Red, and White Plume were the best.

Name of Variety.	Sown in Hot-bed.	Up.	Trans-planted in Hot-bed.	Trans-planted in open.	Fit for use.	Lifted.
White Pascal	Apr. 11	May 1	May 20	July 4	Aug. 16	Sept. 20
Giant Pascal	do 11	do 1	do 20	do 4	do 16	do 20
Giant White	do 11	do 1	do 20	do 4	do 14	do 20
Paris Golden Yellow	do 11	do 1	do 20	do 5	do 16	do 20
New Rose	do 11	do 1	do 20	do 5	do 16	do 20
London Red	do 11	do 1	do 20	do 6	do 14	do 20
White Plume	do 11	do 1	do 20	do 6	do 14	do 20
Giant Golden Heart	do 11	do 1	do 20	do 6	do 16	do 20

CITRONS.

Citrons were sown in hot-bed and transplanted in frames in the garden and in open ground. Those in frames produced much the larger specimens, two citrons weighing fifteen pounds each.

The seed was obtained from W. F. Johnston, of the variety known as Colorado Preserving. They were sown April 17th, transplanted from hot-bed May 26th, and ripe August 20th.

TABLE CARROTS.

Five sorts were tested, Peer of All and Scarlet Nantes being the best.

Name of Variety.	Sown.	Up.	Fit for use.	Lifted.	Remarks.
Henderson's Intermediate	May 2	May 20	July 28	Oct. 14	Very fine.
Half-long Scarlet Carentan	do 2	do 20	do 28	do 14	Rough.
Peer of all	do 2	do 20	do 28	do 14	Very good.
New Long Red Meux	do 2	do 20	do 28	do 14	Stump rooted.
Scarlet Nantes	do 2	do 20	do 28	do 14	Very good.

KALE.

One variety, Plumage, was sown in hot-bed on April 19th, transplanted in hot-bed on April 26th, transplanted to open ground on May 29th, and taken up on September 16th.

KOHL-RABI.

Two sorts were tested. Both were a fair crop.

Purple Goliath, White Vienna, they were sown May 30th, came up June 5th, and were fit for use October 1st.

CORN.

Native corn known also as squaw corn, planted on May 25th, was fit for use on August 29th, and ripe on September 1st.

MUSHROOMS.

A mushroom bed was made in the potato cellar, and the spawn put in on April 8th. The first mushrooms came up on June 22nd, and the bed continued bearing all summer.

LETTUCE.

Four varieties were tested in a hot-bed, and three of these sown in open ground.

Sown in Hot-bed.	Sown.	Trans-planted in Hot-bed.	Fit for use.	Remarks.
New Buttercup	Apr. 17	May 26	July 20	Good.
Denver Market	do 17	do 26	do 26	Good.
Golden Queen	do 17	do 26	do 18	Good.
Large Yellow Market	do 17	do 26	do 30	Good.

Sown in open.	Sown.	Up.	Fit for use.	Remarks.
Denver Market	May 2	May 8	Aug. 15	Good.
Large Yellow Market	do 2	do 8	do 15	Good.
New Buttercup	do 2	do 8	do 15	Good.

MUSK MELONS.

Three varieties of Musk Melons were tried. Sown in pots in a hot-bed and transplanted into frames in the garden. Emerald Gem and Banquet produced a fair crop. Pineapple did not come up. The two former were sown April 17th, came up April 24th, were transplanted May 26th; the Emerald Gem was ripe August 3rd, and the Banquet September 4th.

WATER MELONS.

Two varieties of Water Melons were sown in pots in a hot-bed, and transplanted into frames in garden. The Early Ripe produced a good crop of fair sized melons. The Early Canada was not so large, but produced more fruit. They were both sown April 17th, came up April 24th, were transplanted May 26th, and the Early Ripe was ripe September 2nd, the Early Canada September 4th.

ONIONS.

Eight varieties were sown in a hot-bed and transplanted into the garden, and eight sorts were sown in beds in the garden. All those transplanted did extra well. Three of the varieties sown in the open ground also did well. The best onions though not the largest were Mammoth Red Victoria, Prize taker, Giant Rocca and Red Globe Danvers. In the following table will be found full particulars of the results of this test.

Onions sown in hot-bed.	Sown.	Up.	Transplanted.	Fit for use.	Ripe.	Bushels per acre.
Mammoth White Victoria	Apr. 10	Apr. 16	May 5	July	Sept. 15	388
Mammoth Red Victoria	do 10	do 16	do 5	do	Oct. 12	677
Mammoth Pearl	do 10	do 16	do 5	do	do 12	435
Giant Prize Taker	do 10	do 16	do 5	do	Sept. 15	580
Giant Rocca	do 10	do 16	do 5	do	Oct. 12	629
Red Globe Danvers	do 10	do 15	do 5	do	do 12	580
Yellow Globe Danvers	do 10	do 15	do 5	do	Sept. 15	389
Red Wethersfield	do 10	do 17	do 5	do	do 15	411

Onions sown in open ground.	Sown.	Up.	Ripe.	Bushels per acre.	Remarks.
Red Globe Danvers	Apr. 19	May 23	Sept. 15	365	
Yellow Danvers	do 19	do 23	do 15	435	
Extra Early Red	do 19	do 23	do 15	504	
White Barletta	do 19	do 23	Aug. 30	242	
Scotch Leek	do 19	do 23			No good.
Salzers Earliest	May 27	June 28	Sept. 15	290	
New Queen	Apr. 19	May 23	Aug. 30	290	
Silver Skin	do 19	do 23	do 30	145	

PARSNIPS.

Three varieties were sown, the Intermediate, Student and Maltese. All produced a good crop, there being no perceptible difference in the three. They were sown May 1st, came up June 1st, and were gathered October 12th. The roots in each case were good and smooth.

PEPPERS.

Four sorts were tested, the Large Red Squash, Cardinal, Long Red and Monstrous Mammoth, but none matured.

PEASE.

Nine sorts were sown. Among the small varieties McLean's Little Gem, and American Wonder were best. Among the large sorts Champion of England and Yorkshire Hero were first.

Name of Variety.	Sown.	Up.	Pulled.	Remarks.
McLean's Little Gem	May 3	May 18	July 15	Very good.
New Queen	do 3	do 18	do 28	Large pods. Not well filled.
Early Star	do 3	do 18	do 28	Good.
Heroine	do 3	do 18	do 28	Not well filled.
Stratagem	do 3	do 18	do 28	Good.
Pride of the Market	do 3	do 18	do 28	Fair.
American Wonder	do 3	do 18	do 15	Very good.
Champion of England	do 3	do 18	do 28	Very good.
Yorkshire Hero	do 3	do 18	do 28	Fair.

RADISH.

Five sorts were tested, sown in a hot-bed, and four were sown in the garden. The two best in the hot-bed were Earliest White Forcing, and Earliest Carmine, olive shaped. The best in the garden were Rosy Gem and New Pearl Forcing.

Four kinds of Winter Radish were tested. One Long Red Chinese went to seed but the others did well.

Sown in hot-bed.	Sown.	Up.	Fit for use.	Remarks.
Carmine Olive Shaped	April 10	April 13	May 1	Good.
New Pearl Forcing	do 10	do 13	....	No good.
Olive Gem	do 10	do 14	May 10	Did not do well.
Earliest White Forcing	do 17	do 22	do 18	Very good.
Earliest Carmine, Olive Shaped	do 17	do 22	do 20	Very good.

Sown in open ground.	Sown.	Up.	Fit for use.	Remarks.
Rosy Gem	May 10	May 17	June 20	Extra fine.
Long Salmon	do 10	....	....	Did not come up.
White Forcing	do 10	May 17	June 20	Small.
New Pearl Forcing	June 10	June 17	July 20	Extra fine.

Winter Radish.	Sown.	Up.	Fit for use.	Remarks.
Long Black Spanish	May 30	June 5	Aug. 29	Large fine root.
Long White Spanish	do 30	do 5	do 29	Very large.
Long White Chinese	do 30	do 5	do 29	Fair size, straight.
Long Red Chinese	do 30	do 5	....	All went to seed.

RHUBARB.

Four varieties have been tested, Victoria, Linnæus, Carleton Club and Stotts' Mammoth.

Victoria and Linnæus have given the best results, and were fit for use May 31st. Although not as large as either Carleton Club or Stotts' Mammoth, they are of finer flavour. Carleton Club and Stotts' Mammoth are exceedingly large varieties; one stalk of the former measuring over 9 inches in circumference. Stotts' Mammoth apparently not so suitable to the climate, is gradually dying out.

SALSIFY.

White Salsify—Sown May 2nd; up May 18; fit for use October 12th; very rooty. A poor crop.

SPINACH.

Bloomsdale Savoy Leaved—Sown May 2nd; up May 14th. Frozen.

SAGE.

Sown May 2nd; up May 20th. A good crop.

SUMMER SAVORY.

Sown May 2nd; up May 20th. A good crop,

PARSLEY.

Moss Curled—Sown May 2nd; up June 2nd. Very good crop.

TOMATOES.

Eight sorts were tried. Earliest of All and Extra Early Atlantic were the best for colour, shape and quality of fruit.

Name of Variety.	Sown.	Up.	Trans-planted in hot-bed.	In fruit.	Ripe.	Remarks.
Strawberry. Sown in ground....	Apr. 10..	....	....	....	....	No good.
Extra Early Atlantic...........	do 10.	Apr. 15..	May 15..	June 26 .	Aug. 9..	
Ponderosa.....................	do 10 .	do 16..	do 15..	do 26..	. ...	None ripened.
Early Ruby..........	do 10..	do 17..	do 15..	do 26..	do 12..	
Extra Early Chemin....	do 10..	do 17..	do 15..	do 28..	do 20..	
Dwarf Champion.	do 10..	do 17..	do 15..	do 30..	do 20.	
Yellow Plum......	do 10..	do 17..	do 15..	do 26..	do 7..	
Earliest of All.....	do 10..	do 15..	do 15..	do 22..	do 4..	

TURNIPS.

Four sorts of table turnips were sown, Early Snowball proving the best.

Name of Variety.	Sown.	Up.	Fit for use.	Remarks.
Red-top Strap-leaf........................	May 30..	June 5..	Aug. 9..	No use for garden.
Early Snowball	do 30..	do 5..	do 9..	Very fine.
Orange July............................	do 30..	do 5..	do 9..	Good.
Breadstone..........	do 30..	do 5..	do 9..	Should be "Greystone."

FLOWER GARDEN.

The flower garden suffered considerably from the dry weather, and especially from the hot winds in August. Although many of the flowers were good, some, such as the Pansies, were poor. Sweet Williams, Asters, Stocks, Drummond Phlox and Verbenas were extra fine.

Following are the names of the sorts grown, with remarks on each variety:—

Pansies.—Sowed twelve varieties of German Pansies, and one box seed from Ottawa. Did only fairly well.

Verbenas.—Sown in hot-bed April 12th. Planted in garden June 22nd. Did fairly well.

Pyrethrum.—Sown in hot-bed April 15th. Planted for borders June 15th. Did well; makes good border.

Scabiosa.—New Leviathan: Sown in hot-bed April 15th. Planted in garden June 14th. Bloomed July 20th. Very fine.

Scarlet Flax.—Sown April 15th. Planted in garden June 14th. Bloomed July 10th, till frozen.

Xeranthemum.—(Everlasting.) Sown April 15th. Planted in garden June 22nd. Bloomed August 1st. Good.

Abronia Umbellata.—Sown April 15th. Transplanted June 15th. Did not do well.

Petunia.—Sown April 15th. Transplanted June 22nd. Did well. Flowered throughout the season.

Sweet Peas.—Sown in garden on May 22nd. Did well.

Canna.—German seed. Sown April 15th. Only two plants came up.

Canna tubers from Ottawa.—Potted in hot-bed on April 27th. Planted June 8th. Flowered well.

Gladioli.—Potted in hot-bed April 27th. Planted June 8th. Flowered well till killed by frost in September.

Phlox Drummondi.—Sown in hot-bed April 15th. Fireball, Grandiflora, eight colours, and Nana Compacta, eight colours. Planted in garden June 8th. In bloom July 1st. Continued blooming throughout season. One of the best flowers for this country.

Stocks.—Dwarf German, ten weeks, eighteen colours. Dwarf German, eighteen colours. Large Flowering, eighteen colours. Sown in hot-bed April 16th. Planted June 8. Flowered July 1st. Mass of bloom all season. Large flowering made most show. One of the hardiest and best flowers for this climate.

Dianthus.—Dianthus Imperialis and Dianthus Heddewigii. Sown April 15th. Planted June 9th. In bloom July 10th. Flowered freely all summer. Stands winter well.

Aster.—Victoria, eight colours. Dwarf Bouquet, eight colours, and Truffauts Aster. Sown April 15th. Planted June 8th. In flower August 20th. Made good show till killed by frost.

Godetia—Eight varieties. Sown in hot-bed April 15th. Planted June 8th. Did not do as well as those sown in garden on May 23rd.

Mallow.—Makes good border. Flowers freely.

Zinnia Elegans.—Sown in hot-bed May 18th. Planted June 17th. Made a good show until frozen.

Mignonette.—Matchett, Aurea, Victoria, Pyramidalis and Common. Sown in garden May 23rd. Bloomed in July, and continued throughout the season.

Nasturtiums.—Dwarf and tall varieties did fairly well, but are rather tender for the North-west.

Flowering Flax.—Did well for large borders. Flowers freely and stands winter well.

Eschscholtzia.—Twelve colours. Sown in garden on May 23rd. Made a great show.

Poppy.—Three varieties. Sown May 22nd. Did fairly well.

Convolvulus Minor.—Sown May 22nd. Made a very showy bed. Bloomed all season.

Portulacca.—Sown May 22nd. Good show till first frost.

Carnation.—Sown in hot bed and transplanted. Flowered well and plants are in good shape for winter.

Perennials.

Sweet William.—Stood winter well and made good show.

Larkspur.—Did well. Flowered all season.

Columbine.—Made good show and is quite hardy.

Tulips.—Did well. In bloom early in June.

Peony.—Hardy. Had some fine flowers this season.

Roses.—Only one plant (M. P. Wilder) lived through the winter. but it had some fine roses on during summer.

English Hollyhock.—Sowed seed in hot bed and transplanted into sheltered places. Plants in good shape for next season.

Hyacinthus Candicans.—Planted two bulbs in garden which made flower spikes three feet high.

Yellow Flax.—Stood winter well and made good show this season.

Lupins.—Sowed in hot bed and transplanted in garden. Plants look strong and healthy.

Lilium Thunbergianum.—Stood winter well and had some very fine flowers on this season.

Fruit Trees.

Apple Trees.—Seven varieties of apple trees were planted in spring of 1892. Last spring every tree was dead. The varieties were Hare Pipka, Blushed Calville, Bodi, Red Raspberry, Little Hat, Sugar Sweet, and Saccharine, and as they were planted in a sheltered spot, hopes were entertained that better success might follow with them than with preceding trials, but the result was even worse, as not a live root was left.

The lonely Red Siberian Crab that has weathered four winters, and last year had a few blossoms on, succumbed this spring, and is now numbered with many others of its kind gone before.

Three varieties of Russian Dwarf apple trees, planted in 1889, made a good growth the past season. In previous years these trees were cut back repeatedly, but escaped last winter and are promising.

Last spring 27 varieties of apple trees were planted, consisting of 188 trees. Part of these were set out in a grove of young Manitoba maple trees or box elder, where ample shelter will be afforded them. Every tree is living at this date.

Several trees also of Transcendant crab were planted last spring.

Plums.—Four sorts were planted, consisting of Orleans Blue, Montmorency, Imperial Blue and 100 seedlings of the wild plum. All are alive and have made good growth.

In 1890 one variety of plum was received from Prof. Budd, Iowa. This variety Early Red has been cut back each winter excepting the past one, when the three trees have made a good growth and look promising.

Cherries.—In the spring of 1889, three trees of Blackhill Cherry were received from Prof. Budd, of Ames, Iowa. These have repeatedly been cut back until the past season, when, I have pleasure in reporting they bore fruit. This variety is I believe a native of the Western States but produces a large fruit; much larger than our native cherry, and the flavour being fairly good, it will be an acquisition to our list.

In spring of 1892, three varieties Lutovka, Vladimir and Bessarabian were planted. All were dead this spring.

Three varieties, Old French and Montmorency Cherries and a dwarf variety "Prunus Pumila" were planted the past spring.

SMALL FRUIT.

Currants..—All varieties of currants gave a most abundant crop the past season. All sorts were large and fine, but Fay's Prolific a red variety was ahead of all others in size. No protection was given the bushes. Last spring the following eleven varieties were added to the collection: Versaillaise, New Red Dutch, Odgen's Black, Baldwin's Black, Prince of Wales, Knight's Early Red, La Fertile, La Conde, La Hative, White Transparent and London Red.

The following is result of last season's crop of currants:—

BLACK CURRANTS.

Black Naples.—Ripened from 27th July to 10th August. Crop and currants large, but fruit did not ripen evenly.

Lee's Prolific.—Ripe 27th July. The fruit was of large size and the crop very heavy. Ripened evenly.

The following seedling black currants produced at the Central Experimental Farm have also been tested:

No. $\frac{1}{61}$.—Fairly early. Fruit medium in size and quantity.

Climax.—Ripened evenly on July 27th. Heavy crop of large fruit.

Charmer.—Poor crop of small fruit.

No. $\frac{2}{81}$.—Ripened July 27th. Heavy crop of large fruit.

No. $\frac{1}{12}$.—Poor crop. Medium sized fruit.

No. $\frac{1}{8}$.—Ripened unevenly. Medium crop of small fruit.

Beauty.—Ripened unevenly. Heavy crop of large fruit.

No. $\frac{1}{15}$.—Poor crop of poor fruit.

Dominion.—Ripened evenly. Well laden bushes of fine fruit. The best of all these new varieties with us.

Native Black.—Very large crop. Fruit small.

RED CURRANTS.

Fay's Prolific.—Ripened 5th August. Very large crop of extra sized fruit.

Red Grape.—Ripened evenly on 1st August. Heavy crop of medium sized fruit.

Red Dutch.—Ripened very evenly 1st August. Heavy crop of fine fruit. Bunches large.

Raby Castle.—Ripened evenly 5th August. Large crop of medium fruit.

WHITE CURRANTS.

White Grape.—Ripened 29th July. Bushes loaded down with large bunches of fine fruit.

White Dutch.—Ripe August 1st. A very heavy crop of large fine fruit.

RASPBERRIES.

All varieties of raspberries came through the winter in splendid condition. The crop of fruit was very large, but dry weather injured all but the earliest, and the hot wind which did so much injury all over the country, dried up all the late fruit.

All the canes were laid down before frost came and covered first with two inches of earth, and then with well rotted manure. The covering was left on until May 9th, and then dug in among the canes.

It is very important that the covering should be left on as late as possible, so as to retard the canes in commencing to bud till all danger of frost is past.

The following are the varieties at present under test here:—

Turner.—Large red. Ripe 29th July. A good crop. Stood the dry weather better than any other sort.

Philadelphia.—Large dark red fruit. Ripe 29th July. In the first part of the season the berries ripened well, but dry weather affected the fruit greatly later in the season.

Dr. Reeder.—Ripe 29th July. Heavy crop of fine fruit. Large red berry.

Cuthbert.—Large red berries. Ripe on 5th August. A good crop of well-flavoured fruit.

Caroline.—Fine large orange coloured berries. Heavy crop.

Golden Queen.—Ripe 27th July. Fruit was extra fine, but crop small.

Wild.—Fruit and crop large, but fruit of poor flavour.

STRAWBERRIES.

The old plots of Capt. Jack and New Dominion gave a large and fine crop of fruit, as did also the new plot of these sorts set out in spring of 1892. All the plants were covered with coarse manure during the winter.

GOOSEBERRIES.

These came through the winter fairly well, but some of the young wood was winter killed.

Smith's Improved.—Ripe August 20th. Produced a good crop of fine large berries.

Downing.—Ripe August 25th. Small crop of good sized berries.

HUCKLEBERRIES.

Ten bushes of huckleberries were planted last spring.

Six varieties of raspberries, 11 of currants, 21 of gooseberries, and 5 of strawberries were received and planted last spring, and will be reported on next year.

FOREST TREES.

The past season has been without exception the best for trees since the farm started.

Those that came through the winter of 1891–2 made a good growth, and ripened their wood so thoroughly that no variety was in the least injured last winter, severe though it was. Attention was drawn to this in my last report, and the trees proved to be in even better condition than was expected at that time.

The growth the past summer has been very great, Manitoba maple, willow, etc., growing from three to four feet, and apparently the wood has ripened as well as it did last year. The early part of the season was wet, causing rapid growth, and the latter part being dry, the ripening process was helped to a great extent.

Last spring 9,000 trees were transplanted into groves, shelter belts, wind-breaks and along avenues—drawn from young plantations on the farm, and 8,525 trees received from the Central Experimental Farm, were planted principally in sheltered plots. These consisted of 500 elm, 3,000 oak, 3,000 maple, 1,000 Riga pine, 1,000 spruce and 25 Russian olive. A large number of the oak, Riga pine and spruce died after the dry weather set in.

By actual count there are at present living on the farm, not counting those received this spring from the Central Farm, the following number of trees:—In shelter belts, 46,675; in plantations, 15,800; in avenues, 1,960. These are principally maple grown from seed, and transplanted. In addition there are in lawns, gardens and other places, 270 Riga pine, 389 Norway spruce, 21 cedar, 128 mountain ash, 58

birch, 734 poplar, 650 willow, 25 Russian olive, 50 Russian poplar, 302 cottonwood, 3,500 Nebraska elm, 800 ash, 25 Buffalo berry, 300 elm, and 397 Artemisia. Besides these there are 5,000 three year old maples, 22,000 two year old, and from 10,000 to 15,000 seedlings ready to transplant; a grand total of from 110,000 to 115,000 trees, which as before stated, does not include the 8,525 trees received from Ottawa.

SHRUBS.

Of all the shrubs set out Caragana continues to give the best satisfaction for lawns, etc. The bushes planted in 1890 produced a considerable quantity of seed the past season.

Fig. 2 is from a photograph of one of these shrubs growing on the lawn near the superintendent's house.

FIG. 2. CARAGANA ARBORESCENS, SIBERIAN PEA TREE.
FROM PHOTOGRAPH OF A SPECIMEN AT EXPERIMENTAL FARM, INDIAN HEAD.

Artemisia Abrotanum (Russian) planted for a wind-break, is by far the most valuable shrub planted for that purpose on the Experimental Farm. It is easily propagated, a quick grower, and making a thick mat, is equally as good for a wind-break as for a snow collector, both of which are invaluable on our open prairies.

Thousands of cuttings were sent out to settlers last spring, and thousands are available for the same purpose the coming season.

GROUP OF CATTLE—EXPERIMENTAL FARM, INDIAN HEAD, N.W.T.

Acer Ginnala planted in 1889, though cut back in 1892, grew wonderfully the past season.

Spirea opulifolia, planted in 1889, was for two seasons cut back, but is now apparently hardy. In 1892 and the past season it flowered abundantly and is making a good low hedge.

Last spring the following shrubs were planted:—Nine varieties Lilac; six of Spirea, and five of Syringa. These will be reported on next year.

WIND-BREAKS.

The wind-breaks on the farm are already of great service, and during the past season saved the fruit and vegetable gardens from great injury if not from total loss.

As stated in my report of 1891, wind-breaks consisting of Manitoba Maple, Elm, Willow, Poplar and Artemisia Abrotanum (Russian) were planted around gardens and other plots in that year. The Elm trees have been kept back by rabbits eating the young growth, but all the other sorts grew and thickened up greatly the past season. So far as experience has shown the Artemisia hedge is first, Willow second, Maple third and Poplar fourth in usefulness. Some of the wind-breaks consist of three rows, others of two rows and some only of one row of trees. The trees are planted two and three feet apart in the rows.

Those already set out demonstrate that one row of Artemisia or Willow, with plants two feet apart in rows is ample, and one row of Maple or Poplar is also sufficient if the trees are cut back several times each season for a few years, so as to thicken up at the bottom.

I desire to call the attention of those in the North-west who may wish to have a small and pretty hedge on their lawn or elsewhere, to the fact that the Native Wolf Willow and Native Snowberry, both found in abundance on the prairie, are excellent for that purpose. Either grown from seed or transplanted, they are cheaply and easily obtained and in two or three years, with pruning can be made as nice as any eastern hedge.

Two hedges made from transplanted plants of these shrubs, attract the attention of visitors to the farm, and besides being ornamental are useful as a windbreak around the flower beds and other plots.

CATTLE.

Stock of all kinds on the farm is at present in good health and condition. Since my last report three pure bred Shorthorns, one Polled Angus and six grades have been added to the herd. One Shorthorn cow "Wildflower" died in the summer of inflammation of the lungs.

Fig. 3 shows a group of the cattle in the pasture. From a photograph.

Two experiments were made last winter to determine the relative values of such fodders as can be grown in the North-west. The first test was between ensilage made from oats and barley sown together and the same mixture cured as hay. The second test was between a cereal crop in the form of dry fodder and the best native hay. The cereal crop consisted of oats, barley and rye cut by the binder while in a green state and before being fed cut by the straw cutter.

The tests were started rather late on account of not having the animals for the experiments, and the ensilage gave out when the tests had been under way three months, including the preparatory feeding. The records are therefore for only two months.

Besides the two tests as to the value of the feed, three grade steers and three grade heifers were fed for five months on the same rations to find out the gain of the animals of the different breeds. In addition to the five months of winter feeding the gain of the same six beasts is given for six months while on pasture.

Records have also been kept as to the increase in weight of eight pure bred heifers for twelve months, six months of which they were stall fed and the other six months in pasture, particulars of this test are also given.

TEST OF FEEDING DRY COWS ON A MIXED CEREAL CROP MADE INTO ENSILAGE AGAINST THE SAME MIXTURE CURED AS HAY.

This test was made to find the relative value of the two kinds of feed, both of which can readily be obtained in the North-west. The mixed feed in each case was oats and barley sown together and cut green, one portion made into ensilage and the other into hay.

HAY.

The test was made also to find out whether or not it pays to feed animals during the winter months, so as to obtain not only an increase in weight, but a higher price on account of better quality of beef.

The four cows used in this test were the ordinary grades of the country, of the Durham breed, and in all respects were as nearly equal as it was possible to get them. Before the test was begun, a uniform preliminary feeding of one month was given all the animals.

Ration No, 1—

	Lbs.
Ensilage	35
Meal	5
Daily	40

Ration No. 2—

	Lbs.
Hay	15
Meal	5
Turnips	15
Daily	40

Cows fed on Ration No. 1—

	Lbs.
Weight of two cows, March 20	2,620
Weight of two cows, May 20	2,804
Gain	184

Cows fed on Ration No. 2—

	Lbs.
Weight of two cows, March 20	2,346
Weight of two cows, May 20	2,507
Gain	161

Cost of feed consumed in two months—

Ration No. 1—

2,100 lbs. ensilage, at $2 per ton	$ 2 10
300 lbs. meal, at 60 cents per cwt	1 80
	$3 90

Ration No. 2—

900 lbs. hay, at $4 per ton	$ 1 80
300 lbs. meal, at 60 cents per cwt	1 80
20 bushels turnips, at 10 cents	2 00
	$ 5 60
Cost in favour of ensilage	$ 1 70

Value of Cattle at commencement and at close of feeding—

Lot No. 1—Fed on ensilage and meal—

Weight at start of preliminary feeding, 2,450 lbs. at $2\frac{3}{4}$c...$	67 38
Weight at close of test, 2,804 lbs. at $3\frac{3}{4}$c....................	105 15
Gain...$	37 77
Less food consumed in preliminary feed, $2; test, $3.90...	5 90
Net gain..$	31 87

Lot No. 2.—Fed on hay, meal and turnips.

Weight at start of preliminary feeding, 2,272 lbs., value $2\frac{3}{4}$c.$	62 48
Weight at close of test, 2,507 lbs., $3\frac{3}{4}$c..........................	94 00
Gain...$	31 52
Less food consumed in prelim. feed, $2, in test, $5.60......	7 60
Net gain..$	23 92

This test seems to show, 1st, That cattle gain more on ensilage and meal, than on hay, meal and roots. 2nd. That the cost of ensilage and meal is less than that of hay, meal and roots, and 3rd. That a substantial gain is made in feeding cattle, not only in increase of weight, but in the higher price obtained for the better quality of beef.

TEST OF CEREAL CROP IN FORM OF DRY FODDER *VS.* NATIVE HAY.

Two 2-year old heifers in each lot. Uniform preliminary feeding one month, and test, 8 weeks.

Ration No. 1—

	Lbs.
Dry fodder..	18
Turnips..	20
Meal..	3
Daily..	41

Ration No. 2—

	Lbs.
Native hay..	18
Turnips..	20
Meal..	3
Daily..	41

Weekly gain of heifers fed on Ration No. 1—

	Lbs.
Weight of heifer No. 1—958, 970, 985, 997, 1,005, 1,017, 1,028. 1,042, 1,061 ....Total gain	103
Weight of heifer No. 2—1,203, 1,211, 1,223, 1,234, 1,245, 1,252, 1,276, 1,285, 1.300 ....Total gain	97
Total gain Ration No. 1..................................	200

Weekly gain of heifers fed on Ration No. 2—

	Lbs.
Weight of heifer No. 1—1,130, 1,142, 1,150, 1,159, 1,168, 1,175, 1,183, 1,199, 1,215........................Total gain	85
Weight of heifer No. 2—1,000, 1,009, 1,028, 1,037, 1046, 1,062½, 1,073, 1,081, 1,095........................Total gain	95
Total gain Ration No. 2	180

The above test serves to show that a mixed crop made into hay gives as good results when fed to stock as the best native hay.

GAIN OF 3 GRADE STEERS AND 3 GRADE HEIFERS; FED 5 MONTHS IN STABLE AND 6 MONTHS OF PASTURE.

The sires were pure bred, and the dams grade Durhams.

WINTER RATIONS.

December 13th to January 13th—

	Lbs.
Cut feed........................	10
Turnips	4
Meal........................	2
Oil cake........................	1
Daily........................	17

January 13th to April 1st—

	Lbs.
Cut feed	11
Turnips........................	10
Meal........................	2½
Daily........................	23½

April 1st to May 13th—

	Lbs.
Ensilage........................	10
Cut straw........................	7½
Turnips........................	8
Meal	3½
Daily	29

WEIGHT EACH MONTH WHILE STALL FED.

Breed.	Dec. 13.	Jan. 13.	Feb. 13.	Mar. 13.	Apr. 13.	May 13.	Total gain.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Durham Steer..............	850	892	925	953	975	1,026	176
Holstein Steer..............	666	693	729	740	775	825	159
Polled Angus Steer.	776	792	807	845	875	907	131
Durham Heifer....	525	555	625	646	671	700	175
Holstein Heifer..	673	700	725	750	775	815	142
Polled Angus Heifer.......	554	563	588	632	656	700	146

GAIN ON PASTURE—WITH TOTAL GAIN.

Breed.	May 13.	Nov. 13.	Gain on Pasture.	Gain in Stable.	Total gain 11 mos.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Durham Steer	1,026	1,240	214	176	390
Holstein Steer	825	1,055	230	159	389
Polled Angus Steer	907	1,077	170	131	301
Durham Heifer	700	917	217	175	387
Holstein Heifer	815	963	148	142	290
Polled Angus Heifer	700	870	170	146	316

Showing that the Durham grades gained more than either of the other two breeds, both in stall feeding and on pasture.

GAIN IN WEIGHT OF PURE-BRED HEIFERS.

The gain in weight of eight pure bred heifers for twelve months is given below. From November 12th to May 12th, they were fed a daily ration of 9¼ pounds cut fodder (grain hay), 2½ pounds meal, 3 pounds turnips and as much wheat straw or chaff as they would eat. From May 12th to November 12th, they were on pasture alone, except the twelve days in November, when they were stabled at night.

Breed.	Born.	Weight Nov. 13.	Weight May 13.	Weight Nov. 13.	Gain in Stable.	Gain on Pasture.	Total.
Durhams.		Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Prairie Wild Flower	May 18, 1891.	840	1,061	1,213	221	152	373
Prairie Rosebud	Mar. 26, 1892.	530	705	940	175	235	410
Polled Angus.							
Lady Eaton	Oct. 5, 1890.	1,010	1,147	1,285	137	138	275
Maid of Skene	Aug. 4, 1891.	675	785	950	110	165	275
Stella of Assiniboia	Oct. 10, 1891.	878	1,111	1,250	233	139	372
Pride of Assiniboia	Dec. 6, 1891.	730	930	1,070	200	140	340
Holsteins.							
Abi of Assiniboia	Feb. 10, 1891.	700	870	1,047	170	177	347
Queen of Assiniboia	Sep. 22, 1892.	290	670	890	380	220	580

PIGS.

The increase of pigs during the summer has, on the whole, been satisfactory, but the Yorkshire White litters have done very poorly. They do not appear to thrive as well as those of the Berkshire breed.

Having no suitable building in which to feed young animals, no tests were undertaken the past year, but on completion of the piggery, now in course of erection, feeding experiments will be carried on.

POULTRY.

Very great success cannot be reported in the poultry department for the past year. Although better than that of 1892, it was far from being satisfactory.

The Plymouth Rocks brought up the largest flock of young birds; White Leghorns second.

The Andalusians laid the finest eggs, but the Plymouth Rocks were first in number.

Thirteen settings were sent out to settlers in April and May last.

A better roof has been placed on the poultry building, and an addition made to its size, and the yards also have been enlarged. Though not very extensive, the building is now warm and comfortable.

STALLION.

The Clyde stallion Barlocco, sent by the Haras National Company from Montreal, reached the farm on 28th April last, and remained for three months, serving 52 mares during that time.

Barlocco captured the ninth prize for Clydesdales at the World's Columbian Exposition.

PREPARING LAND FOR CROP.

Three methods were followed in preparing land in the season of 1892 for the crop of the past year. 1st. To plough deep with a single plough soon after seeding and cultivate the surface afterwards with a spring-toothed harrow. 2nd. To gang plough 3 inches deep first, then cultivate the surface to keep down weeds, and after harvest plough deep. 3rd. To gang plough first and last 3 inches deep with surface cultivation between the ploughings.

Wheat, barley and oats were all sown on the three differently prepared soils, and at no time could any difference be observed in the crops. The early part of the growing season being so favourable, the crop of straw was equally heavy on all, and the hot winds did no more damage on the shallow prepared ground than on the deep.

It must, however, be understood that prior to 1892 the land had all been fallowed from 6 to 8 inches deep, and with a season like the past good crops could reasonably be expected on all the fallows.

The past season the land for next year's crop has been prepared in the same three ways, and should the growing season be different, as no doubt it will, a different result will in all probability follow.

MANURING.

The manure from stock during the winter of 1891 and the summer of 1892 was first drawn into one large pile, where it thoroughly rotted. It was then, after the other work on the farm was stopped by frost, drawn out and put on stubble land intended for fallow the past season. The same course will be adopted with manure made last winter and this summer.

DISTRIBUTION OF GRAIN, FOREST TREES, FRUIT BUSHES, TREE SEEDS AND POTATOES.

A distribution of grain, trees, fruit bushes, tree seeds and potatoes was made during March, April and May last.

Four hundred and thirty-one bags of grain, consisting of samples of wheat, barley, oats, pease, flax and spring rye were sent out by mail.

Two thousand five hundred trees, principally Manitoba Maple, or Box Elder, were distributed by mail. Elm, Ash, Poplar, Willow, Cottonwood, Caragana and Lilac were sent out in small lots.

A large number of cuttings of the Artemisia Abrotanum (Russian) were mailed to different parts of the Territories.

Tree seeds were forwarded to 200 applicants.

197 dozen Raspberry plants, 119 dozen Currants, 15 dozen Strawberry plants, 11 dozen Gooseberry and 17 dozen Asparagrus roots were distributed to settlers.

Two hundred and fifteen sample bags of Potatoes were also sent to applicants.

ENSILAGE.

The capacity of the silo having been found insufficient in 1892, an additional silo was built in time for the grain and corn crop this year.

The ensilage came out of the silo, last winter, in good condition, and proved very useful during the winter and early spring months when other succulent food was becoming scarce.

Although last winter was extremely cold no harm was done the ensilage by frost. At no time was there more than a thin crust over the top.

During the past season nearly twice the quantity of ensilage has been put in the silos as there was saved in 1892. At present the corn is being used and is found to be much better than last year, on account, no doubt, of its being further advanced when cut.

IMPROVEMENTS.

Silo.—During the past summer, as stated elsewhere, a silo was built 11 x 12 x 23 feet. Instead of sheeting inside and out with boards and paper before lining it up with siding, only one thickness of flooring was put in on the inside of the silo. So far as the ensilage is concerned this has proved sufficient.

Piggery.—A piggery 24 x 40 feet, one story high, was also built. The walls of this building are concrete, 1 part lime to 9 parts sand and small stones. The walls are 12 inches thick.

Henhouse.—A small addition was made to the hennery, as well as completing the building, which was not done last summer.

Reservoirs.—A large reservoir has been made in the pasture field this fall, as well as additions to the other reservoirs on the farm.

WORLD'S COLUMBIAN EXPOSITION.

As intimated in my last report, the different agricultural societies, towns and individuals, through direction of the North-west Government, sent during the early part of winter exhibits of roots, grain in straw, threshed grain, grasses, etc., to the Experimental Farm, to be cleaned and sorted, and then forwarded to Chicago for the World's Fair.

This work entailed, in connection with the Experimental Farm exhibit, which was prepared at the same time, a large amount of labour. The grain in straw was all carefully sorted, the threshed grain nearly all hand picked, and the grasses sorted and named. Exhibits continued coming in until early in March, when the entire lot was shipped to Chicago.

As soon as vegetables were ready to send this fall, collections were forwarded at different dates, until the season was over.

In the latter part of March I went to Chicago, under your instructions, and remained there several weeks, returning in time for the spring work. While in Chicago I was able to render assistance in installing the exhibits from the different Experimental Farms, and render aid otherwise in the preparation and placing of some of the exhibits from the North-west.

The Experimental Farm at Indian Head received awards for collection of cereals and grasses and collection of vegetables.

LOCAL EXHIBITIONS.

During the past fall a large collection of cereals, roots, grasses and other products of the farm was prepared for exhibition purposes. Only two points, Indian Head and Edmonton, could be reached, and on account of the high rate of express only a small portion of the exhibit could be sent to Edmonton. While in the Edmonton district I was able to attend a fair at St. Albert, but the exhibit of the products of the Experimental Farm did not reach Edmonton in time to permit of their being shown at St. Albert.

VISITORS TO THE EXPERIMENTAL FARM.

The number of visitors to the farm greatly increased during the past season. The change from a night to a day train service, by which visitors from a distance could come and go on the same day, was a very great convenience.

Besides having all the delegates from Great Britain and the United States pay the farm a visit, an excursion party from Moose Jaw and intermediate stations favoured the farm with its presence.

METEOROLOGICAL.

Temperature, maximum and minimum for 11 months; rainfall for the growing season; sunshine for the growing season.

TEMPERATURE.

Months.	Maximum,	Minimum.
January	26° on 20th	—46° on 31st.
February	32° on 18th	—52° on 1st.
March	38° on 31st	—25° on 15th.
April	55° on 30th	1° on 5th.
May	81° on 18th	22° on 24th.
June	92° on 13th	35° on 5th.
July	92° on 19th	36° on 9th.
August	103° on 6th	30° on 28th.
September	93° on 7th	15° on 27th.
October	67° on 19th	4° on 28th.
November to 15th	57° on 6th	3° on 2nd.

RAINFALL.

	Inches.
May	3·17
June	4·60
July	2·12
August	·12
September	·10
Total	10·11

SUNSHINE.

	Hours.
March	130·3
April	126·3
May	289·8
June	250·8
July	283·5
August	273·7
September	138·8
Total	1493·2

I have the honour to remain, sir,

Your obedient servant,

ANGUS MACKAY,

Superintendent.

EXPERIMENTAL FARM FOR BRITISH COLUMBIA

REPORT OF THOMAS A. SHARPE, SUPERINTENDENT.

AGASSIZ, B.C., 31st October, 1893.

To WM. SAUNDERS, Esq.,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith my report for 1893, being the fifth annual report of the work done on the Experimental Farm at Agassiz.

The winter of 1892 and 1893, was the severest known in 30 years, in the western part of British Columbia.

GENERAL VIEW, EXPERIMENTAL FARM, AGASSIZ, B.C.

The first sharp frost was on November 24th, when the temperature was 19 above zero, followed by two nights of 16 above, after which we had warmer weather with showers and light frosts, until December 21st, when we had a sudden drop to 12 above zero followed by 8 above on the night of the 22nd, and very high winds from the north. This was followed by milder weather, and warm showers, several days early in January showing a temperature ranging from 33 to 43, and the lowest recorded for January up to the 24th was 27 above zero. The 25th showed 15 above

with a strong north wind, which continued blowing for several days, and on January 30th the temperature recorded here was 13 below zero, the lowest point reached. The weather began to grow milder early in February, but continued cold through that month and March, followed by a cold wet spring, delaying seeding, and early sown grain did not germinate for a considerable time.

The first grain was sown on April 10th, which was nearly one month later than last year, and vegetation was fully a month behind the average time. As the growth progressed, the damage done to fruit trees by the frost, and the long continued cold drying winds became more apparent.

The cold wet character of the spring continued up to the last of June, when it became warmer, and in July a drought of nearly six weeks set in, and as a consequence, late sown grain, of which there was a good deal, did not ripen early enough to escape the rains which set in early in September.

The hay crop is fair, but grain, roots and fruits are not nearly up to the average in quality or quantity.

This has been the most unfavourable year for farming operations, since the Experimental Farm was started.

Hops.

Hops, which I mentioned in my last report as being tried in several localities, have given good returns, and are commanding very fair prices. Preparations are being made in many places to plant yards on quite an extensive scale, as well as to add to those already planted. Reports as far as received are to the effect that the hop louse has given very little trouble this year, and in the few cases where they did appear, they received prompt attention.

Fruit.

Fruit, I am glad to report is receiving more attention each year. More trees have been planted this year in this province than in any previous year, and more interest is being taken in studying the best methods of cultivation, &c., as well as the best means of fighting the various fruit pests.

The severe weather injured the fall wheat crops on the Experimental Farm, but some varieties suffered much less than others, although all were treated exactly alike, as to time of sowing, soil, exposure, etc.

About ten acres of new land has been ploughed this season and probably nearly as much more will be broken up before the season is over. About twenty acres of land has been cleared of brush and timber, and this, when all is burned off, will be sown to grass seed and added to the pasture available for stock.

FALL WHEAT.

During the high winds in January, the earth was blown off the roots of the wheat plants, and a very large percentage of the crop perished, while those that lived did not start to grow until very late in the spring. Consequently the varieties were all late in ripening as shown by the accompanying table. There was no smut on the wheat this year.

FALL WHEAT.

Name of Variety.	Character of Head.	Sown.	Up.	Headed.	Ripe.	Length of Head. Inches.	Length of Straw. Ft.	No. of days to ripen.	Yield per acre. Bush. Lbs.	Remarks.
Plot No. 1. Canadian velvet chaff	Bald white chaff.	Oct. 19..	Nov. 7..	June 23..	Aug. 18..	3 to 5	4 to 4½	302	20 9	Straw stiff and bright; heads very close and compact. Grain bright, plump and fairly hard. Heads average size, long and well filled out to tip. Very thin on the ground, owing to causes referred to, which affected all alike.
Plot No. 2. Carter's K.	do ..	do 19..	do 7..	July 7..	do 23..	3 3½	4 4½	307	17 38	Straw stiff and bright. Heads medium length, but very well filled out; very plump and bright. This is the best of Carter's fall wheats; stooled well and stood up well.
Plot No. 3. Carter's J	do ..	do 19..	do 7..	do 4..	do 23..	2 3	4 4¼	307	16 6	Heads short and pointed; stooled fairly.
Plot No. 4. Carter's H........	do ..	do 19..	do 7..	do 8..	do 21..	2 3½	3½ 4	305	9 15	A poor wheat, it kills very badly and does not stool well.
Plot No. 5. Carter's G	do ..	do 19..	do 7..	do 9..	do 24..	2½ 3	3	308	8 50	Heads square and well filled out with plump bright grain; did not stool well, badly winter killed.
Plot No. 6. Carter's F..	do ..	do 19..	do 7..	June 22..	do 17..	3 4	4	301	10 55	Heads very open and pointed; did not winter kill as badly as some others, but does not stool well.
Plot No. 7. Carter's E	do ..	do 19..	do 7..	July 2..	do 23..	3½ 4½	4 4½	307	14 17	Heads long and well filled out; very small, white and plump, stands up well and stools fairly.
Plot No. 8. Carter's D	Slightly bearded white chaff.	do 19..	do 7..	do 9..	do 23..	3 3½	3½ 4	307	13 52	Stands up well; heads long and well filled out; stooled fairly well.
Plot No. 9. Carter's C	Bald red chaff ..	do 19..	do 7..	do 5..	do 24.	3 4	3½ 4	308	19 19	Heads well filled out with plump grain; stands up well; stools well; straw bright and stiff.
Plot No. 10. Carter's B	Bald white chaff.	do 19..	do 8..	do 10..	do 22..	2 3	4½ 5	306	18 29	Straw bright and stiff. Heads well filled out; grain plump; stooled fairly well.
Plot No. 11. Carter's A	Bald red chaff. .	do 19..	do 7..	do 6..	do 23..	3½ 4	3½ 4	307	15 58	Straw stiff, standing up well; heads well filled out to tip.

Plot No. 12. Democrat....	Bearded white chaff.	do	19..	do	9.	June	20..	do	18..	3	4	4		302	17 38	Heads fair in length, but very open; not filled out well; did not stool; straw soft.
Plot No. 13. Tasmania.....	Bearded red chaff	do	19..	do	7.	do	6..	do	16..	2½	3	4		300	16 48	Heads very open, and not very well filled out; did not stool; stands up well.
Plot No. 14. Martin's Amber.....	Slightly bearded white chaff.	do	19..	do	8..	do	29..	do	22..	2	3	3	3½	306	11 20	Did not stool well. Heads not well filled out to tip.
Plot No. 15. Early Red Clawson.. ...	Bald red chaff...	do	19..	do	7..	do	13..	do	15..	3	3½	3½	4	299	12 36	Stands up well: heads well filled out to tip; did not stool well.
Plot No. 16. Fill Measure	Bald white chaff.	do	19..	do	8..	July	3.	do	21..	2½	3	3½	4	305	5 53	Heads well filled to tip; very plump, and straw stiff and bright, but was nearly all winter killed.
Plot No. 17. Volunteer	Bearded red chaff	do	19..	do	7..	June	24..	do	17..	2½	3½	3½	4	301	16 23	Heads compact and well filled out to tip; straw bright and stands up well.
Plot No. 18. Manchester.......... ..	Slightly bearded red chaff.	do	19..	do	7..	do	17..	do	16..	3	4	3½		300	24 22	Heads quite open, and not very well filled out; stands up well and very well stooled.
Plot No. 19. Royal Prize Red	Bald red chaff ..	do	19..	do	7..	July	10..	do	24..	3½	4	3½		308	15 57	Heads well filled out, but did not stool; straw bright and stiff.
Plot No. 20. Square Head.....	Bald white chaff.	do	19..	do	7..	do	5..	do	19..	2½	3	3		303	19 50	Only a very small quantity of this variety was available for seed. The head is short, square and generally well filled; straw strong; stands up well.
White Queen..	do	do	19..	do	7..	do	7..	do	20.	2½	3	3¼		304	19 50	Only a few heads of this variety were saved last year and a very small plot sown this year, with the result shown. Too tender for this climate, as it killed badly every year. Heads long and fairly well filled out; grain plump; stands up well.
Plot No. 21. Golden Cross.............	Bearded red chaff	do	19..	do	8..	June	17..	do	16..	3	4	3½		300	23 31	Long heads well filled to tip; stands up well.

Spring Wheat.

Thirty varieties of spring wheat were tested in plots of $\frac{1}{20}$ of an acre. The land for these plots had been very rough. Several large fir stumps had been grubbed out, and in consequence a good deal of levelling had to be done which caused a very uneven growth, and very materially reduced the yield in almost every plot.

Name of Variety.	Sown.	Up.	Headed.	Ripe.	Height.	No. of days to mature.	Yield per Plot.	Yield per Acre.		Remarks.
					ft.		lbs.	bush.	lbs.	
Plot No. 1—Azima	May 5..	May 13..	July 20..	Aug. 28..	2 to 2½	115	17¼	5	45	Bearded; did not stool well.
do 2—Abundance	do 5..	do 13..	do 15..	do 26..	2	113	31¾	10	35	Bearded; did not stool well; heads very short.
do 3—Alpha	do 5..	do 13..	do 14..	do 30..	2½ to 3	117	35	11	40	Bald; heads fair length and well filled.
do 4—Albert	do 5..	do 13..	do 12..	do 26..	2½ to 3	113	40	13	20	Bearded; did not stool well; heads short but well filled.
do 5—Advance	do 5..	do 13..	do 16..	do 28..	2½ to 3	115	58	19	20	Bearded; did not stool well; heads 2 to 3 inches long; well filled.
do 6—Beta	do 5..	do 13..	do 12..	do 28..	2½ to 3	115	51¾	17	15	Bearded; heads short, but well filled out.
do 7—Black Sea	do 5..	do 13..	do 11..	do 16..	3 to 3½	103	53¾	17	55	Bearded; stooled fairly well.
do 8—Carleton	do 5..	do 13..	do 16..	do 26..	2½ to 3	113	50	16	40	Bearded; heads 2½ to 3 inches long and well filled.
do 9—Crown	do 5..	do 13..	do 13..	do 28..	3 to 3½	115	55¼	18	25	Bearded; heads 3 inches long; very even and well filled.
do 10—Colorado	do 5..	do 13..	do 15..	Sept. 2..	3 to 3½	120	63¼	21	5	Bald; heads 3 inches long; fairly well filled.
do 11—Gehun	do 5..	do 13..	do 13..	Aug. 3..	2 to 2½	117	37¾	12	35	Bald; heads short, but well filled; did not stool well.
do 12—Great Western	do 5..	do 13..	do 16..	Sept. 2..	3 to 3½	120	65¼	21	45	Bearded; heads 3 to 3½ inches long; straw soft and easily broken down.
do 13—Hungarian Mt.	do 5..	do 13..	do 16..	Aug. 30..	2½ to 3	117	51	17	..	Bald; heads short and well filled.
do 14—Ottawa	do 5..	do 13..	do 15..	do 28..	3 to 3½	115	40¼	13	25	Bearded; heads 2 to 3 inches long, and well filled.
do 15—Hueston's	do 5..	do 13..	do 17..	Sept. 1..	3 to 3½	119	52¾	17	35	Bald; heads long and plump; did not stool well; very thin crop.
do 16—Ladoga	do 5..	do 13..	do 12..	Aug. 26..	2½ to 3	113	43½	14	30	Bearded; heads medium in length; well filled.
do 17—Pringle's Champlain.	do 5..	do 13..	do 14..	Sept. 2..	2½ to 3	120	39¾	13	15	Bearded; heads short; well filled.
do 18—Prince	do 5..	do 13..	do 15..	Aug. 27..	2 to 2½	114	51½	17	10	Bearded; heads short.
do 19—Preston	do 5..	do 13..	do 13..	do 30..	2½	117	70¼	23	25	Bearded; heads short but well filled; grain plump.
do 20—Red Fife	do 5..	do 13..	do 17..	Sept. 2..	2½ to 3	120	45¾	15	15	Bald; heads short but well filled.
do 21—Rio Grande	do 5..	do 13..	do 16..	do 2..	3 to 3½	120	55¾	18	35	Bearded; heads 3 to 3½ inches long; straw weak and lodged.
do 22—Red Fern	do 5..	do 13..	do 15..	Aug. 30..	2 to 2½	117	44	14	40	Bearded; heads short; not well filled.
do 23—Stanley	do 5..	do 13..	do 12..	do 31..	3	118	57¾	19	15	Bald; heads long and well filled.
do 24—Campbell's Triumph.	do 5..	do 13..	do 13..	do 26..	3 to 3½	113	49	16	20	Bald; heads fair length and well filled.

do	25—White Fife	do	5	do	13	do	15	Sept.	1	3 to 3½	119	50	16	40	Bald; heads fair length and well filled.
do	26—Wellman's Fife	do	5	do	13	do	16	do	2	3 to 3½	120	47¾	15	55	Bald; heads 3 to 3½ inches long; well filled.
do	27—Campbell's White Chaff	do	5	do	13	do	11	Aug.	26	2½ to 3	113	39½	13	10	Bald; heads short.
do	28—White Russian	do	5	do	13	do	14	Sept.	2	3	120	43½	14	30	Bald; heads short.
do	29—White Connell	do	5	do	13	do	14	do	2	2½ to 3	120	45¼	15	5	Bald; heads 2 to 2½ inches long.
do	30—Carter's I., or Anglo Canadian	do	5	do	13	do	19	do	2	3 to 3½	120	40¾	13	35	Bearded; heads 2 to 2½ inches long; not well filled.

BARLEY.

Twenty varieties of barley were tested in plots of $\frac{1}{20}$ of an acre each. The soil and treatment were the same in each case. Below are given the yields as well as other particulars of growth, ripening, etc.

Name of Variety.	Sown.	Up.	Headed.	Ripe.	Height.	No. of days to mature.	Yield per Plot.	Yield per Acre.		Remarks.
					ft.		lbs.	bush.	lbs.	
Plot No. 1—Duckbill............	May 8....	May 16...	July 15...	Aug. 25..	$2\frac{1}{2}$ to 3	109	58	24	8	Stands up well; no smut; did not stool well.
do 2—Danish Chevalier.....	do 8....	do 16...	do 16...	do 25..	3	109	74	30	40	Heads long; stooled fairly well.
do 3—French Chevalier.....	do 8....	do 16...	do 17...	do 24..	$2\frac{1}{2}$ to 3	108	$61\frac{1}{4}$	25	25	Heads only medium; did not stool well.
do 4—Golden Grains........	do 8....	do 16..	do 17...	do 25..	$3\frac{1}{2}$	109	$82\frac{1}{2}$	34	18	Heads long; straw long and soft; easily lodged.
do 5—Goldthorpe..........	do 8....	do 16...	do 20...	do 29..	$3\frac{1}{2}$	113	$74\frac{1}{4}$	30	45	Heads medium; straw stiff and bright.
do 6—Kinver Chevalier....	do 8....	do 16...	do 17...	do 21..	$2\frac{1}{2}$ to 3	108	$53\frac{1}{2}$	22	14	Heads medium long; straw stiff and bright.
do 7—Canadian Thorpe....	do 8....	do 16..	do 17...	do 25..	$2\frac{1}{2}$ to 3	109	$59\frac{1}{2}$	24	38	Heads long and plump; straw stiff.
do 8—Thanet.............	do 8....	do 16...	do 19...	do 25..	2 to $2\frac{1}{2}$	109	$49\frac{1}{2}$	20	30	Heads long; did not stool well.
do 9—Newton.............	do 8....	do 16...	do 20...	do 22.	2 to $2\frac{1}{2}$	106	40	16	32	Heads medium; did not stool well.
do 10—Improved Chevalier..	do 8....	do 16...	do 20...	do 28..	$2\frac{1}{2}$	112	$49\frac{1}{4}$	20	25	Did not stool well.
do 11—Prize Prolific......	do 8....	do 16...	do 20...	do 28..	2 to $2\frac{1}{2}$	112	$40\frac{1}{2}$	16	42	Heads medium; did not stool well.
do 12—Golden Melon.......	do 8....	do 16...	do 23...	do 29..	$2\frac{1}{2}$ to 3	113	$69\frac{1}{2}$	28	46	Heads medium length; straw weak and soft.
do 13—Baxter's Six-rowed...	do 8....	do 16...	June 30...	do 18..	3	102	61	25	20	Heads medium; did not stool well.
do 14—Common Six-rowed..	do 8....	do 16..	July 3...	do 25..	$2\frac{1}{2}$ to 3	109	86	35	40	Heads long and well filled; did not stool well
do 15—Mensury...........	do 8....	do 16...	June 28...	do 16..	3	100	$60\frac{1}{4}$	25	5	Heads medium; did not stool well.
do 16—Oderbruch.........	do 8....	do 16...	July 9..	do 18..	$2\frac{1}{2}$ to 3	102	$67\frac{1}{4}$	28	1	Heads short; did not stool well.
do 17—Odessa............	do 8....	do 16...	do 1...	do 17.	$2\frac{1}{2}$ to 3	101	$54\frac{3}{4}$	22	39	Heads medium; very thin stand.
do 18—Petschora..........	do 8....	do 16...	do 6...	do 18..	$2\frac{1}{2}$ to 3	102	57	23	36	Heads short; very thin stand.
do 19—Rennie's Improved...	do 8....	do 16...	do 6...	do 16..	3 to $3\frac{1}{4}$	100	$57\frac{1}{4}$	23	41	Heads medium; stooled fairly well.
do 20—Six-rowed wh't-barley	do 8....	do 16...	do 12...	do 19..	$2\frac{1}{2}$ to 3	103	$48\frac{3}{4}$	20	15	Heads medium; did not stool well.

Oats.

Forty-one varieties of oats were tested in plots of $\frac{1}{20}$ of an acre each.

They were all sown on the same day, treated in every way alike, the soil was of the same character throughout and fairly uniform. The yield is not very large in any case, but I have no doubt that it would have been much larger could the seed have been sown several weeks earlier.

Name of Variety.	Sown.	Up.	Headed.	Ripe.	Height.	No. of days to mature.	Yield per Plot.	Yield per Acre.		Remarks.
					Ft.		Lbs.	Bush.	lbs	
Plot No. 1—American Beauty	May 17	May 21	July 27	Aug. 31	2½ to 3	106	79	46	16	
do 2—Canadian Triumph	do 17	do 21	do 21	do 23	3 to 3½	98	52	30	20	Did not stool.
do 3—Banner	do 17	do 21	do 26	do 30	2 to 2½	105	68	40	00	Grain plump; straw stiff and bright.
do 4—Black Brie	do 17	do 21	do 30	Sept. 2	2½ to 3½	108	68	40	00	Straw and heads very uneven in length.
do 5—Black Coulommiers	do 17	do 22	do 29	do 3	2 to 3	109	60	32	12	Heads short and light.
do 6—Prolific Black Tartarian	do 17	do 21	do 29	do 2	3	108	85	50	00	Grain plump and straw stiff.
do 7—Bonanza	do 17	do 21	do 22	Aug. 28	3 to 3½	103	71	41	08	Heads medium; grain plump.
do 8—Prolific Black California	do 17	do 21	do 30	Sept. 1	2½ to 3	107	67	39	14	Straw soft and weak.
do 9—Early Archangel	do 17	do 21	do 24	Aug. 30	2½ to 3	105	68	40	00	Inclined to lodge.
do 10—Cream Egyptian	do 17	do 21	do 28	do 31	3 to 3½	106	75	44	00	A fair stand; grain plump.
do 11—Challenge	do 17	do 21	do 27	do 31	3 to 3½	106	63	37	02	Heads short; did not stool well.
do 12—Early Blossom	do 17	do 21	do 31	do 31	2½ to 3½	106	87	51	06	do long; grain plump; straw stiff and bright.
do 13—Early Etampes	do 17	do 21	do 24	do 16	2½ to 3	91	69	40	20	Very early; straw stands up well.
do 14—Early Gothland	do 17	do 21	do 28	do 31	3 to 3½	106	77	45	10	Grain plump; straw bright and stiff.
do 15—Flying Scotchman	do 17	do 21	do 26	do 30	2 to 2½	105	55	32	12	Heads short; did not stool well.
do 16—Golden Side	do 17	do 21	do 30	do 31	2 to 2½	106	60	35	10	do do
do 17—Giant Cluster	do 17	do 21	do 31	Sept. 4	3 to 3½	110	93	54	24	Heads long and close; grain plump.
do 18—Golden Beauty	do 17	do 21	do 26	Aug. 28	3 to 3½	103	98	57	22	Heads very uneven in length, but long and grain plump.
do 19—Hazlett's Seizure	do 17	do 21	do 21	do 26	3½ to 4	98	88½	52	02	A fair stand; heads short; stooled fairly well.
do 20—Holstein Prolific	do 17	do 21	do 27	Sept. 1	2½ to 3	107	84	49	20	Heads medium in length, but did not stool well.
do 21—Abundance	do 17	do 21	do 27	Aug. 30	2½ to 3	105	68	40	00	Straw bright; stands up well.
do 22—Improved Ligowo	do 17	do 21	do 26	do 29	2½ to 3	104	63	37	02	Did not stool well; heads fair.
do 23—Joanette	do 17	do 21	do 27	Sept. 2	2 to 2½	108	60	32	12	Heads and straw short.
do 24—Oderbruch	do 17	do 21	do 30	do 6	3½ to 4	112	95	55	30	do long; straw soft and lodged.
do 25—Poland White	do 17	do 21	do 18	Aug. 26	3½ to 4	101	99	58	08	do and straw long, and stands up well.
do 26—Prize Cluster	do 17	do 21	do 21	do 25	3 to 4	100	80	42	02	Grain plump; stands up well, but did not stool well.

OATS—*Concluded.*

Name of Variety.	Sown.	Up.	Headed.	Ripe.	Height.	No. of days to mature.	Yield per Plot.	Yield per Acre.		Remarks.
					ft.		lbs.	bush.	lbs.	
Plot No. 27—Rosedale	May 17	May 21	July 28	Aug. 31	2½ to 3	106	88	51	26	Straw bright and stiff; heads medium; grain plump.
do 28—Scottish Chief	do 17	do 21	do 19	do 24	2½ to 3	99	56	32	32	A very uneven stand; heads short and light.
do 29—Siberian	do 17	do 21	Aug. 1	Sept. 4	3 to 3½	110	78	45	30	Heads fair length; grain plump.
do 30—Victoria Prize White.	do 17	do 21	July 28	Aug. 26	3½ to 4	101	74	43	18	do medium; straw stiff and bright.
do 31—Welcome	do 17	do 21	do 27	Sept. 1	3 to 3½	107	81	47	08	Straw soft and lodged.
do 32—White Russian	do 17	do 21	do 27	Aug. 31	3	106	74	43	18	Grain plump, but a thin stand.
do 33—Cave	do 17	do 21	do 30	do 30	2 to 2½	105	72	42	12	Did not stool well; heads short.
do 34—Abyssinia	do 17	do 21	do 29	do 31	2½ to 3	106	68	40	00	A light crop; heads short and poor.
do 35—Royal Doncaster	do 17	do 21	do 31	Sept. 2	3 to 3½	108	74	43	18	Grain plump; straw stiff; did not stool well.
do 36—Winter Grey	do 17	do 21	do 26	Aug. 23	3 to 4	98	68	40	00	Stands up well, but a very thin stand.
do 37—Imported Irish	do 17	do 21	do 27	do 23	3 to 4	98	63	37	02	Did not germinate well; crop patchy.
do 38—Columbus	do 17	do 21	do 26	do 30	2½ to 3	105	66	38	28	Very thin stand.
do 39—White Wonder	do 17	do 21	do 27	do 22	2½ to 3	97	49	28	28	Thin stand; did not stool well; grain plump; straw stiff and bright.
do 40—Rennie's Prize White	do 17	do 21	do 27	do 23	3 to 3½	98	62	37	02	Did not stool well; heads short.
do 41—American Triumph	do 17	do 21	Aug. 2	Sept. 2	2½ to 3	108	51	30	00	Straw soft and lodged; heads poor.

Cross-bred Wheats.

Name of Variety.	Amount of Seed.	When Sown.	Up.	Headed.	Ripe.	Length of Head.	Length of Straw.	No. of days to mature.	Yield per Plot.	Remarks.
Plot No. 1.	Oz.					Ins.	Feet.		Lbs.	
Red Fife female with Club Bombay male, plant No. 1...	1	May 2.	May 10.	July 11.	Aug. 25.	3½ to 4	4 to 4½	115	7½	Slightly bearded; red chaff; straw soft and inclined to lodge; heads long but rather open; stooled well; grain medium long but not plump; bright amber and medium hard.
Red Fife female with Club Bombay male, plant No. 2...	1	do 2.	do 10.	do 12.	do 27.	4 to 4½	4½ to 5	117	6	Bald; heads long, tapering and loose; stooled very well; straw soft; grain plump, dark and hard.
Red Fife female with Ladoga male, plant No. 1	1	do 2.	do 10	do 9.	do 29.	4½	3½ to 4	119	7¼	Slightly bearded; heads close and well filled out; straw rather weak and inclined to lodge; stooled well; grain rather soft and dull coloured but plump.
Red Fife female with Ladoga male, plant No. 2..........	1	do 2.	do 10.	do 12.	do 25.	4½ to 5	3 to 4	115	5	Bald; heads compact, well filled and grain plump; straw stiff and stands up well; amber, plump and hard.
Red Fife female with Ladoga male, plant No. 3..........	1	do 2.	do 10.	do 9.	do 24.	4 to 4½	3 to 3½	114	4¼	Bald; stooled well and stands up well; heads close and well filled out.
Anglo Canadian female with Indian Karachi male.......	1	do 2.	do 10.	do 3.	do 23.	2½ to 4	1 to 3	113	3¼	Bearded; very uneven in growth of head and straw; heads fairly close and compact; straw soft and lodged; grain pale amber, plump and quite hard.
Bed No. 7—Hungarian........	1	do 2.	do 10.	....	....	....	....	....	....	This is evidently a fall wheat, as it has not yet headed out.
Bed No. 8—Spiti Valley female with Red Fife male..........	1 lb.	do 4.	do 13.	July 15.	Aug. 27.	2½ to 3½	3½ to 4	115	....	This plot stooled well but sported a great deal, giving bearded and bald white chaff, and the same varieties of red chaff; some ripened much earlier than others. Not threshed; will hand pick this plot to separate different varieties of grain and make clean samples for next year.

HYBRID BARLEYS (sown at the rate of 1½ bushels per acre).

The land for these tests had been in roots in 1892, and for that crop had received a light dressing with fish guano from the canneries, both of which, no doubt, contributed to the excellent showing made.

Name of Variety.	Amount Sown.	Date of Sowing.	Date of coming up.	Headed	Ripe.	Length of Head.	Length of Straw.	Number of Days to Ripen.	Yield per Plot.	Yield per Acre.	Remarks.
	Lbs.					Inches.	Feet.		Lbs.	Bu. Lbs.	
No. 1.—Surprise, six-rowed, Swedish (two-rowed) female, with Baxter's six-rowed male.	1	April 25	May 8	June 30	Aug. 19	3	2½ to 3	116	28	42 00	Stands up well; no smut.
No. 2.—Summit, six-rowed, Swedish (two-rowed) female, with Baxter's six-rowed male.	1	do 25	do 3	July 4	do 20	3 to 5	3	117	68	102 00	Stands up well; stooled very well; heads long and well filled out to tip; no smut.
No. 3.—Type A., six-rowed, Swedish (two-rowed) female, with Baxter's six-rowed male.	1	May 4	do 13	do 3	do 17	3½	2½ to 3	105	44	66 00	Stands up well; heads long and well filled; no smut.
No. 4.—Type 11, six-rowed, Swedish (two-rowed) female, with Baxter's six-rowed male.	1	do 4	do 11	do 8	do 17	3 to 4	3	105	55	82 24	Stooled well; stands up well; heads long and filled out to tip; no smut.
No. 5.—Royal, six-rowed, Swedish (two-rowed) female, with Baxter's six-rowed male.	1	do 4	do 12	do 5	do 16	3 to 4½	3 to 3½	104	74	111 00	An extra fine plot; straw bright and stiff; heads long and very well filled; stooled very well; no smut.
No. 6.—Type P., six-rowed, Swedish (two-rowed) female, with Baxter's six-rowed male.	1	do 5	do 12	do 10	do 21	3 to 4	2½ to 3	109	60	90 00	Stands up well; stooled well; heads wel filled out to tip; no smut.
No. 7.—Type S., two-rowed, Swedish (two-rowed) female, with Baxter's six-rowed male.	1	do 5	do 12	do 13	do 22	4½ to 5½	3 to 3½	110	39	58 24	Stooled well and heads fair length, but straw soft and crinkled down.
No. 8.—Trooper, six-rowed, Swedish (two-rowed) female, with Baxter's six-rowed male.	½	do 15	do 24	do 18	do 22	2 to 3	2 to 2½	100	22	66 00	Stooled well and heads long; straw stiff.

TESTS OF SPRING WHEAT, BARLEY AND OATS SOWN AT DIFFERENT DATES.

These plots were one-tenth of an acre each, and were sown in six successive sowings, one week apart. These plots were all treated alike, and the soil was of the same quality and character, but when each plot was sown the remaining unsown plots were carefully harrowed to kill weeds. This, I think, in part accounts for the heavier yields of the late plots, they also had more favourable growing weather. The earlier sown plots had very cold wet weather which delayed germination and weakened the plants.

SPRING WHEAT—RED FIFE—(Sown at the rate of 1½ bushels per acre).

Date of Sowing.	Date of coming up.	Heading out.	Harvested	Length of Head.	Length of Straw.	No. of days to ripen.	Weight of Grain.	Bushels per Acre.		Remarks.
				in ches.	feet.		lbs.	bush.	lbs.	
Plot No. 1. April 19......	April 27..	July 4.	Aug. 28..	3 to 3½	3	131	160¼	26	42	Stands up well; heads well filled out to tip; no smut.
Plot No. 2. April 26......	May 8..	do 11..	do 30..	2½ to 3	3½	126	160	26	40	Heads not so long as No. 1, but well filled out; stands up well; no smut.
Plot No. 3. May 3.....	do 12..	do 15..	Sept. 2..	2 to 3	3	121	154	25	40	Straw long and bright; heads medium length and well filled; no smut.
Plot No. 4. May 10.....	do 18..	do 20..	do 4..	2½	2½ to 3	116	149	24	50	Stands up well; did not stool well; no smut.
Plot No. 5. May 17.....	do 23..	do 24..	do 7..	3	2½	112	81½	15	15	Straw and heads short; did not stool well.
Plot No. 6. May 24.....	June 1..	do 29..	do 12..	2½	2½	110	127½	21	15	Straw short; did not stool well; heads fairly well filled.

CAMPBELL'S WHITE CHAFF—(Sown at the rate of 1½ bushels per acre).

Date of Sowing.	Date of coming up.	Heading out.	Harvested	Length of Head.	Length of Straw.	No. of days to ripen.	Weight of Grain.	Bushels per Acre.		Remarks.
Plot No. 1. April 19......	April 26..	July 1..	Aug. 22..	3½ to 4	3 to 3½	125	102	17	00	Straw long and stiff; heads long and well filled to tip; a little loose smut.
Plot No. 2. April 26......	May 7..	do 7..	do 24..	3½	3 to 3½	122	132	22	00	Straw bright and stiff; heads long and well filled.
Plot No. 3. May 3......	do 10..	do 14..	do 28..	3 to 3½	3½	118	93½	15	35	Straw long, bright and stiff; heads well filled out to tip; a little loose smut.

CAMPBELL'S WHITE CHAFF—(Sown at the rate of $1\frac{1}{2}$ bushels per acre.)—*Concluded.*

Date of Sowing.	Date of coming up.	Heading out.	Harvested	Length of Head.	Length of Straw.	No. of days to ripen.	Weight of Grain.	Bushels per Acre.		Remarks.
				inches.	feet.		lbs.	bush.	lbs.	
Plot No. 4. May 10	do 18..	do 17..	do 30..	2 to $2\frac{1}{2}$	$2\frac{1}{2}$ to 3	112	105	17	30	Straw stands up well; did not stool well; a little smut.
Plot No. 5. May 17.....	do 24..	do 23..	Sept. 2..	3	$2\frac{1}{2}$ to 3	108	56	9	20	Did not stool well; a little loose smut; did not germinate well; heads very short and not filled out.
Plot No. 6. May 24 .	do 31..	do 30..	do 4..	3	$2\frac{1}{2}$ to 3	103	$95\frac{1}{4}$	15	$52\frac{1}{2}$	Did not stool well; heads short.
BARLEY—BAXTER'S SIX ROWED—(Sown at the rate of 2 bushels per acre.										
Plot No. 1. April 19.. ..	April 24..	June 29..	Aug. 17..	..... .	2 to $2\frac{1}{2}$	121	100	20	40	Straw and heads short; did not stool well.
Plot No. 2. April 26......	May 8..	July 4..	do 19.	....	$2\frac{1}{2}$	116	84	17	24	A poor stand; did not stool well; heads very short.
Plot No. 3. May 3......	do 10..	do 9..	do 22..	....	2	112	78	16	12	A very poor crop; short straw, and did not stool well.
Plot No. 4. May 10......	do 18..	do 13 .	do 24..	....	2 to $2\frac{1}{2}$	107	82	17	04	Straw and heads short; did not stool well.
Plot No. 5. May 17	do 24..	do 17..	do 25..	....	$2\frac{1}{2}$ to 3	101	90	18	36	Stood up well, but did not stool well; heads short.
Plot No. 6. May 24......	do 31..	do 19..	do 26..	....	$2\frac{1}{2}$	95	88	18	16	Heads short; a poor stand.
DUCKBILL—TWO ROWED—(Sown at the rate of 2 bushels per acre.)										
Plot No. 1. April 19......	April 26..	July 2..	Aug. 21..	....	$2\frac{1}{2}$ to 3	125	91	18	46	Only five plots were sown in this instance. None of them stooled, and all were a poor stand.
Plot No. 2. April 26... .	May 9..	do 11 .	do 23..	....	3 to $3\frac{1}{2}$	120	83	17	14	

Plot No. 3. May 3.....	do 12..	do 14..	do 26..	....	3 to $3\frac{1}{2}$	115	83	17	14	Only five plots were sown in this instance. None of them stooled, and all were a poor stand.
Plot No. 4. May 10.....	do 17..	do 19..	do 28..	....	3 to $3\frac{1}{2}$	110	69	14	8	
Plot No. 5. May 17......	do 24..	do 24..	Sept. 3..	....	$2\frac{1}{2}$ to 3	109	102	21	12	
OATS—AMERICAN BANNER—(Sown at the rate of $2\frac{1}{2}$ bushels per acre).										
Plot No. 1. April 19........	April 25..	July 12. .	Aug. 19..	....	$3\frac{1}{2}$ to 4	122	162	47	22	Straw long and stiff; heads long and well filled with plump grain; did not stool well.
Plot No. 2. April 26........	May 7...	do 15...	do 24..	....	$3\frac{1}{2}$ to 4	120	167	49	4	Straw long, bright and stiff; standing up well; grain plump.
Plot No. 3. May 3..........	do 10...	do 19...	do 28..	....	$3\frac{1}{2}$ to 4	117	175	51	16	Long full heads; plump grain; straw stiff.
Plot No. 4. May 10.........	do 18...	do 23...	do 30..	....	$3\frac{1}{2}$ to 4	112	197	57	32	Good full heads; straw stiff; stooled a little.
Plot No. 5. May 17.........	do 24...	do 27...	Sept. 2..	....	$3\frac{1}{2}$ to 4	108	224	64	24	Straw bright and stiff; heads good; stooled fairly well.
Plot No. 6. May 24.........	June 1....	do 31...	do 4..	....	$3\frac{1}{2}$ to 4	103	231	67	32	Good well filled heads; straw bright and stiff; stooled fairly well.
PRIZE CLUSTER—(Sown at the rate of $2\frac{1}{2}$ bushels per acre).										
Plot No. 1. April 19........	April 26..	July 9...	Aug. 19..	....	$3\frac{1}{2}$ to 4	122	123	36	6	Stands up well; did not stool well; a thin stand; heads fair.
Plot No. 2. April 26........	May 7...	do 13...	do 23..	....	$3\frac{1}{2}$ to 4	119	164	48	8	Stands up and stooled fairly well.
Plot No. 3. May 3..........	do 10...	do 18...	do 24..	....	$3\frac{1}{2}$ to 4	113	144	42	12	Did not stool very well; heads short.
Plot No. 4. May 10...	do 18...	do 20...	do 26..	....	$3\frac{1}{2}$ to 4	108	144	42	12	Straw bright and clear; did not stool well.
Plot No. 5. May 17.........	do 26...	do 24...	do 29..	. ...	$3\frac{1}{2}$ to 4	104	146	42	32	Stands up well; heads short.
No. 6.—May 24.	do 31...	do 30...	Sept. 1...	....	$3\frac{1}{2}$ to 4	100	179	52	22	Stooled fairly well; heads short.

FIELD PEASE.

Twelve varieties of field pease were sown, at the rate of from 2½ bushels per acre for small pease, to 3½ bushels per acre for the larger varieties.

Name of Variety.	Seed per acre.	Sown.	Ripe.	Length of straw.	Length of pod.	Yield per plot.	Yield per acre.	
	Bushels.			Feet.	Inches.	Lbs.	Bush.	lbs.
Multiplier	2½	May 15	Sept. 5	3	2	128½	21	25
Mummy	3	do 15	do 2	3½ to 4	2 to 2¼	126½	21	5
New Potter	2½	do 15	Aug. 30	3½	2½ to 3	119½	19	55
Crown	2½	do 15	do 29	2½	2	70¼	11	42½
Centennial	3	do 15	do 30	4½	2¼	102	17	
Prussian Blue	2½	do 15	do 31	4	2	120½	20	05
Pride	3	do 15	Sept. 1	2½	2½	117	19	30
Prince Albert	2½	do 15	do 3	3	2	94	15	40
Golden Vine	2½	do 15	do 4	3½	1½	94½	15	45
Rennie's No. 10	3⅓	do 15	do 1	3½	2	122½	20	25
Black-eyed Marrowfat	3½	do 15	Aug. 28	3½	2	101½	16	55
White Marrowfat	3½	do 15	do 29	3½	1¾	80½	15	05

CORN.

Eleven varieties of corn were planted in rows three feet apart, and the stalks thinned out to four to six inches in the row.

The same varieties were planted in hills three feet apart each way, leaving two to four stalks in the hill.

The drills are the least trouble to plant, and there does not appear to be any advantage to compensate for the extra trouble of planting in hills.

The season has been a very poor one for corn, the wet weather in the spring rotted some of the seed, and retarded the growth of that which did germinate.

CORN.

Name of Variety.	Planted.	Up.	Tasselled.	Early Milk.	Late Milk.	Height.	Cut.	Weight per acre.	Remarks.
						Feet.		Tons. Lbs.	
Rural Thoroughbred, in rows	May 30	June 8	Aug. 30	....	....	6 to 8	Oct. 16	20 808	Just showing silk, October, 16th.
do in hills	do 30	do 8	do 30	....	....	do	do 16	19 963	
North Dakota, in rows	do 30	do 9	do 24	Oct. 8	....	5 to 6	do 16	13 1,000	
do in hills	do 30	do 9	do 24	do 8	....	do	do 16	13 700	
Great Northern, in rows	do 30	do 16	do 24	Sept. 16	Oct. 10	5 to 7	do 16	15 485	Ears large and well filled out; stalks leafy.
do in hills	do 30	do 16	do 24	do 16	do 10	do	do 16	15 670	
Gold Coin, in rows	do 30	do 8	do 23	do 20	do 16	5 to 6	do 16	15 500	Ears 4 to 5 inches long and well filled out; stalks very leafy.
do in hills	do 30	do 8	do 23	do 20	do 16	do	do 16	14 900	
Angel of Midnight, in rows	do 30	do 12	do 20	do 12	do 5	6 to 7½	do 16	16 1,196	Ears long and well filled.
do in hills	do 30	....	....	....	....	....	....	16 307	
Compton's Early, in rows	do 30	do 10	do 23	....	....	6 to 8	do 16	20 65	Cobs formed but not in early milk when cut.
do in hills	do 30	do 10	do 23	....	....	do	do 16	17 1,930	
Mitchell's Extra Early, in rows	do 30	do 10	do 6	do 4	do 1	4 to 5	do 16	8 1,420	Corn glazed when cut; ears 4 to 5½ in. long, and well filled out.
do in hills	do 30	do 10	do 6	do 4	do 1	do	do 16	8 960	
Pearce's Prolific, in rows	do 30	do 13	do 24	do 25	do 12	5½ to 7	do 16	17 840	Ears long and well filled; stalks leafy.
do in hills	do 30	....	....	....	....	....	....	16 1,768	
Smut Nose Flint, in rows	do 30	do 12	do 26	Oct. 4	do 6 to 7.	6 to 7½	do 16	22 1,163	Ears long and fine, but late.
do in hills	do 30	do 12.	do 26	do 4	....	do	do 16	22 73	
Golden Dew Drop, in rows	do 30	do 15	do 28	do 1	....	6 to 8	do 16	23 1,938	Ears long; stalk stout and leafy.
do in hills	do 30	do 15	do 28	do 1	....	do	....	20 1,760	
Mastodon Dent, in rows	do 30	do 15	Sept. 4	....	....	7 to 10	do 16	37 75	Stalk very large and leafy, but cob only formed; no corn.
do in hills	do 30	do 15	do 4	....	....	do	do 16	36 850	

BROOM CORN.

Three varieties of broom corn were planted on May 24th, and came up June 5th, but as they did not mature sufficiently to be of use as broom corn, only about two per cent being headed out October 16th, the crop was cut and put into the silo. The varieties planted were Early Bush Evergreen, Improved Dwarf and California Golden Long Brush.

TESTS OF MIXTURES OF GRAIN CUT GREEN, AND CURED FOR FEED—ONE-TENTH ACRE PLOTS.

Mixture No. 1.—Contained pease, barley and oats in the following proportions, 6 pounds of pease, 5 pounds of Prize Prolific barley and 3½ pounds of oats, or at the rate of 1 bushel of each per acre. This was cut when the pease were nearly fit for table. The yield per acre green was 5 tons, 1,793 pounds, and when dried 2 tons 1,903 pounds.

Mixture No. 2.—Six pounds of Golden Vine Pease, 6 pounds of Red Fife Wheat, 3½ pounds of Banner Oats. This was cut when the wheat had formed, and was in early milk stage, and gave at the rate of 6 tons 73 pounds, green; and when dried 2 tons 1,407 pounds, losing rather more than No. 1, perhaps on account of being cut a little greener.

The stock ate both mixtures greedily and wasted none.

LATHYRUS SYLVESTRIS WAGNERI.

This has again been allowed to ripen its seed for distribution. I distributed all that was produced last season, but have not yet had any reports.

Neither our cattle nor horses care for it when green. They were led to the plot during June and July, but in no case would they eat it, but preferred the green grasses growing alongside.

In this climate where the clovers, timothy, rye grass and other valuable grasses, grow and produce excellent crops, it does not appear to be worth cultivating.

It may however prove valuable in the interior, where there is a scarcity of rain. As it is said to withstand drought, and if fed a little at a time, cattle might grow to like it.

TURNIPS.

Eleven varieties of turnips were sown alongside, and under precisely similar conditions as to land and treatment.

The sowings were made, as in the case of the mangels, two weeks apart, and the result shows in favour of early sowing.

Name of Variety.	Date of Sowing.	Up.	Yield per Plot.	Yield per Acre.	
			Lbs.	Bush.	Lbs.
Rennie's Prize Purple Top, 1st sowing	May 13..	May 21..	420	616	
do do 2nd do	do 26..	June 1..	197	288	56
Sutton's Champion, 1st sowing	do 13..	May 26..	325	478	30
do 2nd do	do 26..	June 1..	272	398	56
Mammoth Purple Top, 1st sowing	do 13..	May 22..	267	391	36
do 2nd do	do 26..	June 3..	237	347	36
Carter's Prize Winner, 1st do	do 13..	May 20..	308	485	4
do 2nd do	do 26..	June 1..	227	339	56
Selected Purple Top, 1st sowing	do 13..	May 21..	339	497	72
do 2nd do	do 27..	June 2..	252	369	36
Jumbo, 1st sowing	do 13..	May 21..	291	426	48
do 2nd do	do 27..	June 1..	202	296	16
Carter's Elephant, 1st sowing	do 13..	May 21..	390	572	10
do 2nd do	do 26..	June 1..	252	374	
Bangholm Improved, 1st sowing	do 13..	May 21..	400	586	40
do 2nd do	do 27..	June 1..	251	368	8
Selected East Lothian, 1st sowing	do 13..	May 21..	305	447	20
do 2nd do	do 27..	do 31..	188	275	44
Skirving's Purple Top, 1st sowing	do 13..	do 29..	340	498	40
do 2nd do	do 27..	June 12..	242	354	56
Monarch 1st sowing	do 24..	May 31..	320	469	20
do 2nd do	June 7..	June 12..	212	310	56

Three additional plots of turnips were sown on June 14th.

Two new varieties were sent by Mr. Simmers, seedsman, Toronto, and for comparison Rennie's Prize Purple Top was sown alongside. As the quantity of seed of the new varieties was limited, it was all sown on the same day. All of these varieties would have given a heavier crop if sown a month earlier.

Name of Variety.	Date of Sowing.	Date of coming up.	Yield per Plot.	Yield per Acre.		Remarks.
			Lbs.	Bush.	Lbs.	
Simmers' Champion	June 14..	June 18..	308	451	44	Round, smooth roots; small tap root; top small and close to the bulb; very fine even crop.
Simmers' Giant	do 14..	do 18..	336	492	48	Long, well formed, smooth bulb; top strong and healthy.
Rennie's Prize Purple Top	do 14..	do 18..	422	618	56	Bulb smooth, well shaped and even.

ROOT CROPS.

Two sowings each of mangels, turnips and carrots were made.

MANGELS.

Ten varieties of mangels were sown. Two sowings were made two weeks apart. The season has been a very poor one for mangels, the spring growth was very slow, and when the drouth set in they almost stopped growing.

It will be seen that the late sown seed produced a much lighter crop than the earlier sown, with two exceptions, viz., Erfurt Model and Canadian Giant:—

Name of Variety.	Date of Sowing.	Date of coming up.	Yield per Plot.	Yield per Acre.	
			Lbs.	Bush.	Lbs.
Erfurt Model, 1st sowing	May 12	May 22	164	240	32
do 2nd do	do 26	Juue 4	183	268	24
Mammoth Long Red or Gate Post, 1st sowing	do 12	May 21	206	302	12
do do 2nd do	do 26	June 4	112	164	16
Canadian Giant, 1st sowing	do 12	May 22	158	231	44
do 2nd do	do 26	June 3	176	258	08
Giant Yellow Intermediate, 1st sowing	do 12	May 23	188	275	44
do do 2nd do	do 26	June 2	130	190	40
Champion Yellow Globe, 1st sowing	do 12	May 23	126	184	48
do do 2nd do	do 26	June 5	102	149	36
Red Globe, 1st sowing	do 12	May 22	88	129	04
do 2nd do	do 26	June 5	80	117	20
Golden Tankard, 1st sowing	do 12	May 21	74	108	31
do 2nd do	do 26	June 4	60	88	00
Red Fleshed Tankard, 1st sowing	do 12	May 22	90	132	00
do 2nd do	do 26	June 3	78	110	44
Warden Orange Globe, 1st sowing	do 12	May 22	120	176	00
do do 2nd do	do 26	June 4	80	117	20
Mammoth Long Red, 1st sowing	do 12	May 21	110	161	20
do do 2nd do	do 26	June 3	94	121	18

CARROTS.

Nine varieties of carrots were sown on land that had been in pease the year previous, and in fodder corn in 1891, and had never had any manure. This, with the unfavourable year and late sowing, accounts for the light yield.

Name of Variety.	Date of Sowing.	Up.	Pulled.	Yield per Plot.	Yield per Acre.
				Lbs.	Tons. Lbs.
Improved Short White, 1st sowing	May 15	May 25	Oct. 31	171	12 1,080
do do 2nd sowing	do 22	June 7	do 31	80	5 1,733
Early Gem, 1st sowing	do 15	May 26	do 31	101	7 813
do 2nd sowing	do 29	June 8	do 31	74	5 852
Mammoth White Intermediate, 1st sowing	do 15	May 25	do 31	130	9 1,067
do do 2nd sowing	do 29	June 8	do 31	132	9 1,353
Carter's Orange Giant, 1st sowing	do 15	May 25	do 31	120	8 1,600
do do 2nd sowing	do 29	June 7	do 31	103	7 1,105
Chantenay ½ long Scarlet, 1st sowing	do 15	May 24	do 31	114	8 720
do do 2nd sowing	do 29	June 7	do 31	82	6 27
White Belgian, 1st sowing	do 24	do 2	do 31	124	9 186
do 2nd sowing	June 7	do 13	do 31	102	7 960
White Vosges, 1st sowing	May 24	do 1	do 31	134	9 1,653
do 2nd sowing	June 7	do 13	do 31	88	6 907
Long Red Coreless, 1st sowing	May 24	do 2	do 31	106	7 1,573
do 2nd sowing	June 7	do 13	do 31	78	5 1,388
Danvers Orange, 1st sowing	May 24	do 2	do 31	140	10 533
do 2nd sowing	June 7	do 13	do 31	90	6 1,200

SUGAR BEETS.

Four varieties of sugar beets were sown. Two sowings of each variety were made in rows 30 inches apart and the plants thinned to about 6 inches in the rows. Three rows 66 feet long were weighed and the yield per acre computed.

The following is the yield per plot and per acre:—

Name of Variety.	Date of Sowing.	Up.	Pulled.	Yield per Plot.	Yield per Acre.
				Lbs.	Tons. Lbs.
Klein Wanzleben, 1st sowing	May 24	June 3	Nov. 1	102	4 976
do 2nd sowing	June 7	do 16	do 1	72	3 336
White Improved (Vilmorin's), 1st sowing	May 24	do 3	do 1	124	5 912
do do 2nd sowing	June 7	do 17	do 1	102	4 976
Greentop Brabant, 1st sowing	May 24	do 3	do 1	98	4 624
do do 2nd sowing	June 7	do 16	do 1	74	3 522
French (very rich), 1st sowing	May 24	do 4	do 1	98	4 624
do do 2nd sowing	June 7	do 15	do 1	64	2 1,642

Potatoes.

Thirty-one varieties of potatoes were planted this year, some of them have been tested before, but many of them for the first time. Owing to cold wet weather in spring, and a period of very hot dry weather when it did clear up, the potato crop is rather light in this locality.

Name of Variety.	Planted.	Date of coming up.	Growth.	Matured.	Size.	Weight.	Yield per acre.	Market-able.	Rotten.
						2 rows, 66 ft.			
						Lbs.	Bush.	per cent.	Lbs.
Everett	May 16	June 8	Slender	Early	Medium	108	216	80	.....
Daisy	do 16	do 6	do	do	Small	60	120	75	7
Early Sunrise	do 16	do 6	do	do	Medium	100	200	75	10
Sharpe's Seedling	do 16	do 7	Medium	do	do	80	160	60	.....
Crown Jewel	do 16	do 6	Slender	do	do	83	166	70	.....
Holborn Abundance	do 16	do 8	Strong	Late	Large	145	290	80	.....
						1 row, 66 ft.			
Northern Spy	do 16	do 7	Medium	Early	Medium	42	168	80	.....
						2 rows, 66 ft.			
Dakota Red	do 16	do 9	do	Late	do	124	248	80	.....
State of Maine	do 16	do 6	Slender	do	do	106	212	70	13
Burpee's Extra Early	do 16	do 7	Medium	Early	do	86	172	60	4
Polaris	do 16	do 7	Slender	do	Small	90	180	50	3½
Bruces W. Beauty	do 16	do 9	Medium	do	Medium	96	192	60	.....
						1 row, 66 ft.			
Pearce's Prize Winner	do 16	do 8	do	do	do	60	240	70	1½
						1 row, 33 ft.			
Toronto Queen	do 16	do 9	Slender	do	do	24	192	75	1
						1 row, 33 ft.			
Earliest of all	do 16	do 6	do	do	do	21	168	75	.....
American Giant	do 16	do 8	Medium	Late	do	24	192	80	.....
						1 row, 66 ft.			
New Variety No. 1	do 16	do 9	Strong	do	do	54	216	90	.....
I.X.L	do 16	do 9	Medium	do	do	54	216	90	.....
Chicago Market	do 16	do 11	do	do	do	74	296	80	.....
						1 row, 33 ft.			
Green Mountain	do 16	do 8	Slender	do	do	38	304	75	2
Rural Blush	do 16	do 12	do	do	Small	25	200	70	.....
						1 row, 66 ft.			
Early Rose	do 16	do 6	Medium	Early	Medium	58	232	80	.....
						2 rows, 66 ft.			
Clarke's No. 1	do 16	do 9	do	Late	do	140	280	80	3
Vanguard	do 16	do 11	Slender	Early	do	100	200	75	3

Empire State	May 16	June 9	Strong	Late	Large	1 row, 66 ft. 94	376	80	6½
Algoma No. 1	do 24	do 18	Slender	Early	Small	2 rows, 66 ft. 52	104	60	....
Delaware	do 24	do 20	Medium	do	do	54	108	75	2
Lee's Favorite	do 24	do 19	do	Late	do	40	80	60	....
Early Puritan	do 24	do 20	do	Early	do	54	108	75	2½
Munro County	do 24	do 21	Slender	do	do	1 row, 66 ft. 35	140	70	....
Lizzie's Pride	do 24	do 20	Medium	do	Medium	34	136	75	....

TEST WITH BORDEAUX MIXTURE.

Only one plot of potatoes was tested with Bordeaux mixture this year. The Dakota Red, which was planted in a dry loam, being used for this test and although there was no rot in either plot, the results show an advantage, more than sufficient to cover the cost of spraying, especially where potatoes are planted in low ground.

The potatoes were sprayed on July 20th, August 10th and 24th, and September 8th. This was oftener than necessary, but there was a considerable quantity of blight on the unsprayed alongside, and the last two sprayings were given to protect from that danger.

The tops of the sprayed remained healthy and vigorous until ripe, there being no blight on the foliage.

—	Date of Planting.	Up.	Size.	Yield per plot.	Yield per acre.	Market-able.	Rotten.
				Lbs.	Bushels.	Per cent.	
Potatoes not sprayed.	May 24..	June 18..	Medium........	124	248	75	
Potatoes sprayed.....	do 24..	do 18..	Above medium .	135	270	85	

HYBRIDS PRODUCED AT AGASSIZ, 1892.

The crosses made last summer by Mr. A. P. Saunders, B.A., and myself, were sown last spring, from which we have quite a number of new varieties of wheat, barley and pease, some of which it is hoped may be useful additions to the lists of these grains.

A number of crosses were made this summer, a few of which have been successful.

Twenty-four varieties of seedling potatoes have been selected from a lot produced from seed, in the summer of 1891. These will be planted another year, and any of sufficient merit will be distributed for testing on other farms.

CAULIFLOWERS.

Fifteen varieties of cauliflowers, were sown in a hot-bed in spring, and transplanted as soon as the plants were large enough.

The varieties were:—Walcheren, Le Normand Short Stem, Autumn Giant, Italian Taranto, Large Algiers, Half Early Dwarf French, Early Dwarf Erfurt, Large Early London, Stadtholder, Early Paris, Thorburn's Nonpariel, Extra Large Erfurt, Gilt Edged Snowball, Early Snowball, Large Early Dwarf Erfurt.

Early Snowball was fit for use August 2nd, which was the earliest, followed by Large Early Dwarf Erfurt, August 10th, and Thorburn's Nonpareil, August 17th; Lenormand's Short Stem, September 1st. Autumn Giant is the latest and one of the best, being large, crisp and fine, and keeps for a longer time than any of the others.

MILLETS.

Three varieties of millet were sown, Pearl Millet, White French Millet and American Millet. Neither Pearl nor White French Millet were worth anything, only growing from two to five inches high and not heading out. The American grew from nine to fifteen inches, but did not head out nor did it stool. It yielded less than one ton per acre.

HEMP.

A small plot of hemp was sown, but it did not do very well, it grew fifteen to twenty-four inches high and very slender.

JUTE.

A plot of this plant was sown, but it only grew from six to ten inches high, and an early frost in October killed it.

PEANUTS.

A small quantity of peanuts were planted in warm sandy loam on the bench. Above ground the growth has only been from six to ten inches, and below, the nuts did not develop larger than small pease.

SUNFLOWERS.

Five pounds of Giant Russian Sunflower seed was sown in May. It was sown at the rate of nearly ten pounds per acre with a Planet Jr. seed drill in rows three feet apart, and thinned when about a foot high to about twelve inches in the row.

On October 16th and 17th the heads were taken off, to mix with the corn in the silo. The weight of heads produced was 9,690 pounds, or at the rate of over eight tons per acre.

APPLES.

The severe winter no doubt shortened the apple crop, but otherwise there was no damage done to the trees on the Experimental Farm.

Although some of the varieties were brought from as far south as Texas, they have made a strong growth, and appear to be equal to any demands made on them by the climate here.

Quite a number of the trees planted in the spring of 1890 fruited this year, and we were able to contribute some fine apples, as well as plums, to the Experimental Farm Exhibit at Chicago, and also to make a small exhibit of fruit at some of the British Columbia Exhibitions.

The following varieties fruited this year:—

Red Astrachan, Fameuse, Wealthy, Alexander, Ben Davis, Baldwin, Yellow Transparent, Tetofsky, Maiden's Blush, Duchess of Oldenburg, American Golden Russet, Gravenstein, Spitzenburg.

These fruited freely, and are too well known in British Columbia, to need any comment on them.

Ribston Pippin.—This has proved with us to be a very desirable apple. It fruits young, fruit above medium size, and is free from spot or scab, and is of first quality, keeps well up to the middle of March.

Hurlbut.—Is an apple not very well known in British Columbia. Fruited first time with us this year, fruit above medium size and rather handsome, yellow with red stripes, and although not yet fit for use, promises to be a very desirable early winter apple, either for dessert or cooking.

Colvert.—Above medium, very irregular in shape, not of very high quality.

Red Bietigheimer.—A very large handsome fruit, liable to spot.

Warner's King.—Very large, green with a blush on the sunny side; may be valuable for cooking.

McMahan's White.—Large and very handsome; a free producer, and a strong vigorous grower; may be desirable as a cooking apple.

St. Lawrence.—Productive and handsome, a medium sized winter apple.

Red Canada.—Small medium ; productive, a winter apple.

Hastings.—A medium sized winter apple.

Fanny.—Of medium size and productive.

Keswick Codlin.—Large and a free producer, handsome, and a desirable fall cooking apple.

Walbridge.—Medium size. Tree vigorous, but not very productive when young. The Walbridge trees were three years old when planted (the only trees of that age put out) and only produced about five apples each this year.

Seek-no-Further.—A large fine cooking apple, moderately productive, quality good. Season September to November.

Longfield.—A very handsome medium sized apple. Bears young, and apt to be very small unless severely thinned; a juicy pleasant late fall and early winter dessert apple.

Bombshell.—Above medium in size, very irregular in shape, a fall apple, not valuable.

Cooper's Market.—Above medium in size, a winter apple.

Grimes Golden.—Medium. Very clean and free from blemishes. Tree vigorous and productive, at this date very hard, a winter apple.

Fall Jenneting.—Of large size and inclined to spot. Tree vigorous and fairly productive, a fall apple.

Haas.—Fruit above medium size, tree vigorous and productive ; a fall apple.

Jonathan.—Small. Tree a slow grower, and not very productive.

Salome.—Medium size. Tree vigorous, very few apples this year.

Waxen.—Medium to large, tree vigorous, a very few apples.

Wellington.—Large tree, vigorous, only a few apples.

Sweet Bough.—A large handsome apple, useful for dessert.

Golden Sweet.—Medium large, desirable for early autumn ; dessert.

Talman Sweet.—Medium in size. Tree a moderate grower. productive.

Quite an additional number of varieties produced two or three apples, these will be referred to later when the crop is larger.

A large number of varieties have been planted this year, some of which have been obtained from England and others from different American nurseries.

From England.

Ashmead's Kernel Improved, Bismarck, Claygate Pearmain, Cockle Pippin, Cox's Orange Pippin, Devonshire Quarrenden, Dutch Mignonne, Golden Harvey, Golden Nonpareil, Juneating Red, King of the Pippins, Mannington's Pearmain, Margil, Peasgood's Nonesuch, Rosemary Russet, Tyler's Kernel, Washington, Wyken Pippin, Yellow Ingestre.

From other sources :

Golden, Stone Niemetz, No. 331, Early Bogdanoff, Renaud's Seedling, Arabka Winter; Walworth Pippin, Simbirsk No. 11, Stone Antonovka, Crimean Bogdanoff, Bogdanoff, Royal Table, Blushed Calville, Golden Reinette, Early Strawberry, Early Pennock, Golden Sweet, Summer Pippin, Summer Redstreak, Sops of Wine, Sweet June, Trenton Early, Cole's Quince, Dyer, Fall Wine, Fall Winesap, Fall Orange, Fulton, Flora Belle, Porter, Ramsdell's Sweet, Switzer, Shockley, Arkansas Beauty, American Beauty, Bauman's German, Borsdorf, Black Twig, Big Romanite, Carthouse, Clayton, Day, Fink, Iowa Blush, Ishams Sweet, Ingram, June Market, Lansingburgh, Milan, Minkler, Missouri Superior, Perry Russet, Plum's Cider, Price's Sweet, Pumpkin Sweet, Roman Stem, Rubicon, Red Winter Pearmain, Shannon Pippin, Sweet Spitzenburg, Shackelford, Smoke House, Utter's Large Red, Vandevere Pippin, White Winter Pearmain, Wythe, Waxy Juicy, Western Beauty, Yellow Newtown Pippin, Rebel, Frazer River Beauty, British Columbia, Clayton, Garfield Sugar, Lindsay, Cross, Grandmother, Volga Anis, Streaked Sweet, No. 379, Champagne, Romna, Striped Anis, Hebron, Klinett, Which with those previously planted, makes 289 varieties of apples.

PEARS.

This has been a decidedly poor year for pears in this valley. Very few trees bore any fruit this year, but we have no losses to report, and the severe winter did not affect the growth which has been strong and vigorous.

Large additions have been made to the pear orchard, trees having been received from England and from different nurseries in America, Amongst others from England this year are two William's Bon Chrétien, or Bartlett. It will be interesting to note what difference, if any, climate has made in this popular variety. The trees previously planted, having been obtained from trees many years in America.

New varieties planted in 1893 *imported from England.*

Aston Town,	Bergamotte d'Esperin.	Gansel's Bergamot,
Huyshe's Bergamot,	Beurre Baltet Père,	Beurre Brown,
Beurre d'Amanlis,	Beurre d'Aremberg,	Beurre de Capiaumont.
Beurre Rance,	Bon Chrétien,	Catillac,
Chaumontel,	Citron des Carmes,	Colmar d'Eté,
Compte de Lamy,	Conseiller de la Cour,	Dr. Jules Guyot,
Doyenne d'Alencon,	Doyenne du Comice,	Durondeau,
Fondante d'Automne,	Fertility,	Forelle,
General Todtleben,	Glou Morceau,	Gratiole of Jersey,
Hacon's Incomparable,	Hessle,	Jargonelle,
Madam Treyve,	Magnate,	Marie Benoist,
Marie Louise d'Uccle,	Knight's Monarch,	Nouvelle Fulvie,
Nouveau Poiteau,	Princess (Rivers),	St. Swithin's,
Thompson's,	Triomphe de Vienne,	Uvedale's St. Germain.
Van Mons,		

From American nurseries we have received :—

P. Barry,	B. S. Fox,	Lucy Duke,
Wilder Early,	Directeur Alphande,	Col. Wilder,
Giffard,	Vermont Beauty,	Smith's Hybrid,

Japan Golden Russet, and Seneca.

All of these, notwithstanding the long time some of them were in transit, are alive and have made substantial growth. There are now 112 varieties of standard pears in the orchard.

Dwarf Pears.

The dwarf pear does not seem to endure severe cold so well as standards of the same varieties. Several of the dwarf trees in the orchard died after leafing out this spring, and last year's growth was seriously injured in every case.

PLUMS.

The collection of plums has also been increased by importation from England, and from several other sources, including the Central Experimental Farm

The names of those received this year are as follows:—

From England—

Angelina Burdett,	Belgian Purple,	Belle de Louvain,
Belle de Septembre,	Bittern,	Cox's Emperor,
Curlew,	Diamond,	Early Favourite,
Early Prolific,	Early Transparent Gage,	Gisborne's,
Goliath,	Grand Duke,	Heron,
Huling's Superb,	Ickworth's Imperatrice,	July Green Gage,
Kirke's,	New Late Transparent,	Magnum bonum Red,
Magnum bonum White,	Mallard,	Mitchelson's,
Monarch,	Orleans Old,	Orleans New,
Oullins Golden Gage,	Pershore,	Reine Claude Rouge,
Stint,	Sultan,	The Czar,
Transparent Gage,	Cluster Damson,	Frogmore Prolific Damson,
King of the Damsons,	Prune Damson,	River's Early Damson.

From other sources:—

Decaisne,	Glass Seedling,	Forest Rose
White Nicholas,	Milton,	De Soto,
Wolf,	Early Red,	Rockford.
Yellow Voronesh,	Wyant,	

From Messrs. McGill and McDonald, Tenant Prune.

The plum orchard now contains 124 varieties.

Plums.

Quite a number of the plum trees planted three years ago, fruited this year and some varieties were heavily laden, viz.: Moore's Arctic, Lombard, Pond's Seedling, Gueii, Munroe, Duane's Purple, Smith's Orleans, Victoria, Prune d'Agen, and Hudson River Purple Egg.

Name of variety.	Ripe.	Remarks.
Saunders	Aug. 20	Fruit medium size; long, yellow, and of good quality.
Moore's Arctic	Sept. 4	Fruit above medium in size; dark purple; good flavour; tree a very free producer.
Gueii	do 23	Fruited first time this year; averaging 55 lbs per tree; fruit bluish purple of fair quality.
Victoria	do 20	Fruit very large; light red; very handsome and of fair quality. Averaged about 45 lbs. per tree.
Prune d'Agen	do 21	Fruit medium. A free producer; averaging 40 lbs. per tree.
Pond's Seedling	do 28	Fruit large and handsome; egg shaped light red; flesh rather coarse; a free producer; 50 lbs. per tree.
Lombard	do 21	Fruit medium in size; round; pleasant flavour; productive; over 100 lbs. per tree.
Smith's Orleans	do 23	Above medium in size; reddish purple; fine flavour; productive.
Duane's Purple	do 25	Above medium in size; reddish purple. Good quality. Average over 45 lbs. per tree.
Hudson River Purple Egg	do 23	Fruit medium in size. Good quality. Average over 45 lbs. per tree.

THE following trees produced a few plums each.

Varieties.	Ripe.	Remarks.
Peters' Yellow Gage	Sept. 20	Medium to large.
Yellow Egg	do 22	Very large.
Sugar Plum	do 16	Medium.
Damson	Oct. 3	Small.
Reine Claude	Sept. 24	Medium.
Fellenberg	do 18	do
Peach Plum	Aug. 20	Very large.
Coe's Golden Drop	do 26	Large.
Bleeker's Gage	do 20	Medium.
Red Egg	do 20	Large.
Washington	do 19	Above medium.
German Prune	do 26	Medium.
Bradshaw	Sept. 14	Large.
Imperial Gage	do 13	Above medium.
Italian Prune	do 24	Medium.
Columbia	do 20	Very large.
Jefferson	do 12	Medium.
General Hand	do 27	Medium to large.
Niagara	do 14	Large.
Moyer	do 16	Medium.
Large Golden Prolific	do 21	Above medium.
Shippers' Pride	do 24	do

CHERRIES.

The cherries blossomed very freely last spring, but only a few set fruit, and almost all of the fruit fell off when about a quarter grown.

Fig. 1 is from a photograph of a cherry tree at the Experimental Farm, Agassiz, second year from planting, showing the character of the growth.

The extreme cold of last winter, followed by the cold wet weather which continued all through the blossoming season, proved unfavourable for this fruit.

The cherry trees have, however, shown no lack of wood growth, and judging from the fruit buds, there is promise of an abundant crop of this, as of all other fruits next season.

The following additional varieties have been planted this year :—

Arch Duke, Early Rivers, White Heart, Rose, Gruner Glass, Strauss Weichsel, Orel No. 20, Downton, Nouvelle Royal, Shadow Amarelle, Koslov Morello, Glaskirsch Doppelte, Koeper, Early Lyons, Royal Duke, Orel No. 24, Heart Shaped Weichsel, Orel 19, King's Morello.

There are now 67 varieties of cherry trees in the orchard.

NECTARINES.

Nectarines suffered severely from the cold of last winter. On nearly every tree the previous year's growth was killed and had to be removed, and in young trees that is nearly all the growth there is the first spring. Most of the trees have, however, made a fairly strong growth this year.

The new varieties planted this spring are :—

Albert Victor, Humboldt, Hunt's Tawny, and Pine Apple; there are now in all 16 varieties in the orchard.

PEACHES.

Like the Nectarines and Apricots, the peaches suffered very severely from the cold winter. Almost every tree lost the growth of 1892, and several trees of the previous spring's planting died. This did not, in many cases, appear to be due to tenderness of the variety, as in several varieties one tree died and the other lived (in most instances there are only two trees of a variety) and made in some cases a very vigorous growth.

Fig. 2 represents a peach tree, second year from planting, from a photograph.

Fig. 1. CHERRY TREE, SECOND YEAR FROM PLANTING, EXPERIMENTAL FARM, AGASSIZ, FROM A PHOTOGRAPH.

Where the trees were severely pruned back early in spring, they appear to have recovered sooner, and have made better growth than when the pruning was light.

The curl leaf in the peach and nectarine trees was worse this year than it has ever been before, the Malta being the only variety on the level land that was entirely healthy.

The varieties received in spring from England and planted on the level land were just as badly affected as the others. Among those affected, those that suffered least, were : Crawford's Early, Redcheek Melocoton, and Lemon. The first and second bench orchards suffered alike with those on the level ground, but the orchard highest up at an elevation of about 800 feet had no curl in any case, and the trees appear to have suffered less from the cold than those lower down.

The varieties of peaches in this orchard are :

Early Crawford, Hilborn, Mountain Rose, Crane's Early Yellow, Lewis Seedling; of Nectarines the Boston is the only sort planted there.

These varieties were procured from the same source as those in the orchards on the lower levels, were planted about the same time, and the conditions as to soil, aspect and protection, are very much the same, the only difference being in elevation.

The additions in 1893 to the collection are the following:—

Barrington, Crimson Galande, Condor, Dr. Hogg, Grosse Mignonne, Noblesse, Sea Eagle, Stirling Castle, Sulhampstead, Violette Hative, Walburton Admirable.

These were from England; and Longhurst and Fitzgerald, Canadian; making now 139 varieties in all.

FIG. 2. PEACH TREE, SECOND YEAR FROM PLANTING, EXPERIMENTAL FARM, AGASSIZ, B.C.. FROM A PHOTOGRAPH.

APRICOTS.

The Apricots suffered severely from the cold winter. A few feeble blossoms appeared, but no fruit set, and some of the trees have made very feeble growth. Three have died, quite a number have lost several large limbs, but I hope these may recover.

Only two new varieties have been planted this year: Harris and Misch Musch.

FIGS.

All but two fig bushes died from the effects of the cold weather, the survivors are: One Brown Turkey and one Early Violet which were only killed to the ground and have sent up strong shoots. The others have since been replaced with the following varieties:—

Roi du Noir, Brown Ischia, Madeleine, Pregussata, Brown Turkey, Col de Signora Bianca, White Genoa, Castle Kennedy, Black Ischia.

There are now 10 varieties of figs in the plantation, all looking well.

BENCH PLANTING.

The Apple, Pear, Plum, and Cherry Trees, in all of the bench orchards have made a vigorous growth this year, and the peaches as mentioned elsewhere have been entirely free from curl leaf on the highest bench.

There has been planted on the benches a large number of nut bearing trees of different varieties. Black Walnut, Butternut, Hickory nut, Chestnut, and between three and four thousand timber trees, such as different varieties of Ash, Elm, Oak, Maple, White Pine, Black Cherry, Locust, Beech and Birch. These are doing well and making satisfactory growth although there was no preparation of the ground, or care of the trees after planting, the only expense being in planting carefully, and then letting the trees take their chances. In all about 4,000 forest trees have been planted on the bench.

GRAPES.

No new additions have been made to the collection of grapes, and only three varieties have had any fruit this season, in no case were the bunches or berries perfect, and none of them ripened. The cold wet weather delayed growth so much and there was not heat enough to ripen the fruit, the collection consists of 90 varieties embracing most of the desirable sorts.

NUTS AND MULBERRIES.

An orchard has been planted containing a few trees each of English, American and Japanese Walnuts; Spanish, American and Japanese Chestnuts; Hickory, Chinquapin and Pecan nuts; Downing's everbearing New American, Black and White English Mulberries. These were put out last spring and have made good growth.

Also an orchard of hard and soft shell and Lanquedoc Almonds, and Cosfords, Pearson's Dwarf Red, White and Cut leaved filberts. These have all made satisfactory progress, and the Cosford filbert although transplanted from the nursery row very late, has borne very fine nuts this season.

The almond appears to be hardier than the peach, as the last year's growth of the trees was not seriously injured, and they do not appear to have any leaf disease.

There are now twenty varieties of nuts in the collection.

GOOSEBERRIES.

A large number of gooseberries were received from England last spring, and a few from nurseries in America.

The Downing and Golden Prolific gave a small crop this year. They were sprayed with the Bordeaux mixture which appeared to check the mildew very considerably, but it was not received in time to spray early in spring, and perhaps on that account the benefit was not so great as it would otherwise have been.

The varieties received this year are as follows:—

From England:—Speedwell, Leader, King of Trumps, High Sheriff, Bobby, Blackley Hero, Beauty, Leveller, White Champagne, Red Warrington, Red Champagne, Queen Victoria, Pitmaston Green Gage, Lancashire Lad, Improved Early Hedgehog, Green Overall, Governess, Early Sulphur, Dublin, Bonny Lass, Companion, Eva.

From other sources—Red Jacket, Mountain, Columbus and Oregon Seedling. Which makes in all 38 varieties now in the collection.

CURRANTS, RED AND WHITE.

Owing to the severe cold weather last winter and spring the old currant bushes did not fruit freely this year: their growth during summer has been healthy, and all are promising well for 1894.

The following is a list of the new varieties which have been added this year:—

La Conde, Raby Castle, Knight's Early, White Gondoin, La Hative, Prince Albert, White Transparent, La Fertile, New Red Dutch, London Red. Making 21 varieties in all.

BLACK CURRANTS.

The black currants were a very poor crop, the berries were small and lacking in flavour, and some of them dried up before ripening. The bushes have made a vigorous growth.

The following new varieties have been added to the collection:—Prince of Wales, Russian Black Currant, Baldwin's and Crandall. Making in all 39 varieties.

RASPBERRIES.

Besides those mentioned in my report of 1892, only five new varieties have fruited this year. Of the red berries, the Cuthbert and Saunders' Seedling, Sarah proved the best, and Golden Queen the best of the yellow ones. Several of the newer black caps fruited sparingly, viz.

Cromwell.—Beginning to ripen July 12th. Fruit medium size, only fair in quality, canes vigorous and prolific.

Progress.—Canes vigorous, not very prolific, berry good size, firm and of fair quality. Ripening July 10th.

Thompson.—Fruit small and poor, may be better next year, canes only medium growers. Ripening July 13th.

Palmer.—Vigorous grower, and prolific; berries large, sweet, and of good flavour. Ripening July 8th.

Eight varieties of Raspberries were received from England, and a large number from different nurseries in America, including twelve of the new seedlings from the Central Experimental Farm, giving sixty-three varieties of Red, Yellow and Black Raspberries on trial at present.

The following is a list of those received since 1891:—

Early Ohio, Carman, Nemaha, Champlain, Crimson Beauty, Baumforth's Seedling, Belle de Fonteney, Lord Beaconsfield, Northumberland Fill Basket, White Antwerp, Carters Prolific, Superlative, Fastolf, Muriel, Trusty, Mary, Empire, Duncan, Sir John, Carleton, Lady Anne, Sharpe, Craig, Garnet, Gladstone, Muskingum, Hilborn, Rancocas, Reider, Tyler and Muskegon.

BLACKBERRIES.

Four varieties of Blackberries fruited this year. Agawam, Taylor and Snyder, which were reported as bearing last year and the Kittatinny, which fruited for the first time this year. Each of these varieties produced berries of good size and quality.

The growth this year has been vigorous, and all on hand are likely to fruit next year.

There are now in the collection 26 varieties, of which the following is a list :—

Agawam,	Dallas,	Crystal White,
Dorchester,	Early Harvest,	Child's Everbearing,
Early Cluster,	Gainor,	Early King,
Erie,	Lawton,	Kittatinny,
Minnewaska,	Nevada,	Lovett's Best,
Snyder,	Taylor's Prolific,	Stone's Hardy,
Wilson Junior,	Wilson's Early,	Tecumseh.
Wachusett Thornless,	Thompson's Early,	Western Triumph,
Bruntun,		Evergreen Blackberry.

LUCRETIA DEWBERRIES.

Last year's report of these berries must be repeated this year.
Fruit irregular in size, berries imperfect, and flavour poor.

STRAWBERRIES.

The weather of last winter and spring was very injurious to the strawberry and the crop was light and poor.

None of the later additions to the collection, bore fruit this season.

Another year's experience with the varieties that fruited last year confirms the opinion then formed, that of the number tested, Bubach, Wonderful, Sharpless, Jessie, and, if heavily manured, the Wilson, are the most profitable for market, and for home use, Maggie, Cumberland Triumph and Gandy. These are all very desirable berries.

The following varieties from the Central Experimental Farm, England, and other sources have been added this year :

From the Central Experimental Farm :—

Miller's Seedling, 02,	Westlawn,	Beder Wood,
Staymans No. 1,	Auburn,	Van Deman,
Princess,	Beverly,	Westbrook,
Middlefield,	Martha,	Crawford,
Cameronian,	Gillespie,	Miller's Seedling, H.H.
Ruby,	Yale.	Haverland,
Mrs. Cleveland,	Pearl,	Shirts,
Eureka,	King of the North,	Mammoth,
John Little,	Parker Earle,	Hautbois,
Windsor Chief,	Daisy,	Moore's Prolific,
Sunrise,	Surprise,	Turner's Beauty,
Governor Hoard,	Hoffman's Seedling.	Advance,
Ottawa,	Garibaldi,	Derby,
Castle,	Flora,	Edith,
Ruth,	Countess,	Stanstead,
Early Canada,	Paul,	Bartons,
Nicanor,	Cohansick,	Boynton,
Lady Rusk,		

From England :—

Alexander II.,	Alpha,	Bonny Lass.
British Queen,	Dr. Hogg,	Eclipse,
Empress Eugenie,	John Ruskin,	Laxton Jubilee,
Amateur,	Laxford Hall Seedling,	Sir Joseph Paxton.

From J. T. Lovett, Iowa Beauty, Chairs.

Making 54 varieties, in addition to those already reported on.

FLOWERS AND SHRUBS.

Nearly all of the roses were killed to the ground last winter, but a large number came up from the roots. And in addition, a large collection was received from England in the spring, and they have with very few exceptions, made a fair growth. Such shrubs as the ivy, holly, laurels, ceanothus and wistarias were killed to the ground. Many of these have sent up strong shoots, and will soon recuperate.

Many of the bulbs, such as hyacinths, crocuses, snowdrops, squills and tulips planted last fall were injured, and although many of them bloomed, the flowers were feeble and inferior to those of the previous season.

A fine assortment of gladiolus and dahlia bulbs were received in spring. These made a splendid show in their season. A fine selection of annual flower seeds forwarded from the Central Farm was received and sown, and produced a splendid display of flowers all summer.

HEDGES.

The osage orange hedge planted in the spring of 1892 stood the winter very well, and made a fine growth this summer.

About 600 yards of native cedar have been set out along the road fence, and although the summer has been very unfavourable for transplanted trees and shrubs less than a dozen trees will replant all that are dead.

Thirty-one hedges, of ornamental shrubs, each 66 feet long, were set out last spring and all excepting the Siberian pea have grown with scarcely a gap.

The shelter belt mentioned in my last report has done very well and will soon occupy all the ground. Only about a half dozen trees were required to fill vacancies last spring. A row of maple trees has been planted on both sides of the road which leads from the Harrison Hot Springs road to the buildings, all of which have done well.

A large number of shrubs of various kinds were planted about the grounds, near the buildings and are doing well, and in another year will be an attractive feature of the farm.

LIVE STOCK.

All the live stock continue healthy, and I have to report a good demand for young bulls old enough for service. Since my last report two Shorthorn bulls and one Ayrshire bull have been sold at fair prices.

There have been many inquiries after young pigs, which I hope to be able to supply next season.

The Dorset horned sheep mentioned in my last report, have not yet been very prolific, one lamb is all the produce as yet from the two ewes.

The poultry have suffered from hawks and weasels. These dangers will be lessened when the new poultry house, now in course of construction, is completed.

STALLION.

The Haras National Co. sent out a very good Clyde stallion, and many people expressed a desire to patronize him, but in some instances contracts had been made with owners of other stallions before this one arrived, which necessarily limited the service.

FENCING.

About half a mile of fence has been built, during the last year; and more will be put up as opportunity offers.

EXHIBITIONS.

Quite an assortment of fresh fruit was sent to the Chicago Exhibition for which the Agassiz Experimental Farm received a special award. Exhibits of fruit, and of grain in the straw and cleaned were also made at local exhibitions.

Several exhibitions in various parts of the province were attended, and a marked improvement in many departments noticed, over exhibitions of the past two or three years. Although the fruit exhibit was small, the quality even this year was excellent, and in the interior where irrigation is carried on, the roots were magnificent.

WEATHER.

Months.	Date of Lowest Temperature.	Date of Highest Temperature.	Number of days on which it rained.	Total Rainfall.	Number of Days when Sunshine was Recorded.	Total amount of Sunshine.	Number of Snow Storms.	Amount of Snow which fell.
1893.	°	°		Inches.		Hrs. Min.		Inches.
January	31st 13	53	11	$4 \cdot \frac{94}{100}$	19	67 03	2	1
February	2nd 12	20th 52	10	$3 \cdot \frac{91}{100}$	14	49 27	9	34
March	20th 29	5th 63	14	$6 \cdot \frac{74}{100}$	21	87 06	2	1
April	18th 32	26th 72	23	$5 \cdot \frac{89}{100}$	14	42 33	4	22
May............	24th 39	27th 80	23	$6 \cdot \frac{57}{100}$	21	105 30		
June............	3rd 39	5th 90	15	$5 \cdot \frac{44}{100}$	26	137 42		
July............	24th 41	30th 91	8	$1 \cdot \frac{55}{100}$	29	195 12		
August	25th 41	31st 97	6	$1 \cdot \frac{83}{100}$	29	244 14		
September......	23th 37	1st 87	14	$4 \cdot \frac{98}{100}$	20	107 21		
October.........	23rd 29	28th 67	17	$6 \cdot \frac{24}{100}$	20	63 00		
November 1st to 15th..........	1st 29	13th 55	11	$7 \cdot \frac{11}{100}$	7	27 18	1	2½

DISTRIBUTION OF GRAIN.

A considerable quantity of grain was distributed last spring, but owing to the lateness of the harvest very few have their threshing done, and in consequence I have only received reports from a few farmers.

VISITORS.

I am pleased to report that the interest taken in the farm is increasing, as evidenced by the greater number of visitors and increase of correspondence.

I have the honour to be, sir

Your obedient servant,

THOS. A. SHARPE,

Superintendent.

STATEMENT of Expenditure on the Dominion Experimental Farms, for the Year ending 30th June, 1893.

CENTRAL EXPERIMENTAL FARM.

EXPENDITURES, 1st July, 1892, to 30th June, 1893.

	$ cts.
Live stock	299 00
Feed for stock, including experimental feeding of steers and swine; also veterinary services	681 57
Seed grain, trees, shrubs, &c	1,301 97
Implements, tools, hardware and supplies	883 43
Draining and drain tiles	184 91
Manure and fertilizers, including wages of teamsters drawing manure from city during winter	1,840 80
Travelling expenses	585 91
Exhibition expenses	88 75
Blacksmithing, repairs to wagons, vehicles, &c.; also harness supplies and repairs	466 01
Books, periodicals and newspapers	212 23
Telegrams and telephones	185 35
Wages, farm work, including experimental work with grain and other farm crops; also salaries of farm foreman and director's assistant in experimental work	6,123 27
Wages, care of stock, including experiments in feeding cattle and swine	1,905 66
do horticultural department, including salary of horticulturist	2,788 47
Poultry department, including salary of poultry manager	1,348 35
Care of forest plantations, grounds and shrubbery	614 34
Dairy department	728 35
Extension of water pipes to buildings	281 13
Contingencies, including building sidewalks, $77.17	459 15
	20,978 65

EXPERIMENTAL FARM, MARITIME PROVINCES.

EXPENDITURES, 1st July, 1892, to 30th June, 1893.

	$ cts.
Feed for stock and veterinary services	44 97
Seed grain, trees, shrubs, &c	132 28
Implements, tools, hardware and supplies	201 42
Draining and drain tiles	660 63
Manure and fertilizers	387 70
Travelling expenses	48 02
Exhibition expenses	36 06
Blacksmithing and repairs	61 24
Salaries	1,400 00
Wages, farm work, including experimental work with farm crops, fruit trees, vines, &c	1,381 48
do care of stock	692 11
do office help	100 00
Contingencies	79 69
	5,225 60

EXPERIMENTAL FARM, MANITOBA.

Expenditures, 1st July, 1892, to 30th June, 1893.

	$ cts.
Feed for stock and veterinary services	64 43
Seed grain, trees, shrubs, &c	441 74
Implements, tools, hardware and supplies	1,096 43
Draining and drain tiles	118 12
Manure and fertilizers	153 93
Travelling expenses	135 65
Exhibition expenses	93 25
Blacksmithing and repairs	291 17
Telegrams and telephones	57 42
Distribution of seed grain	90 56
do forest trees	265 28
Salaries	1,400 00
Wages, farm work, including experimental work with farm crops, fruit trees, vines, &c	3,063 03
do care of stock	804 12
do forestry, tree planting	337 50
do office help and mail messenger	230 77
Contingencies, including material and labour in construction of poultry building, $462.31	681 87
	9,325 27

EXPERIMENTAL FARM, NORTH-WEST TERRITORIES.

Expenditures, 1st July, 1892, to 30th June, 1893.

	$ cts.
Live stock	389 20
Feed for stock and veterinary services	297 70
Seed grain, trees, shrubs, &c	462 05
Implements, tools, hardware and supplies	691 85
Manures and fertilizers	149 50
Travelling expenses	50 60
Exhibition expenses	113 82
Blacksmithing and repairs	244 67
Distribution of seed grain and forest trees	71 45
Salaries	1,400 00
Wages, farm work, including experimental work with farm crops, fruit trees, vines, &c	3,083 23
do care of stock	1,019 50
do forestry, tree planting	136 50
do office help	110 00
Contingencies, including internal fences, $121.49	384 53
	8,604 60

EXPERIMENTAL FARM, BRITISH COLUMBIA.

Expenditures, 1st July, 1892, to 30th June, 1893.

	$ cts.
Live stock	2,112 00
Feed for stock and veterinary services	854 66
Seed grain, trees, shrubs, &c	810 01
Implements, tools, hardware and supplies	944 92
Manure and fertilizers	119 71
Travelling expenses	121 32
Blacksmithing and repairs	21 50
Salaries	1,400 00
Wages, farm work, including experimental work with farm crops, fruit trees, vines, &c	2,844 25
do care of stock	147 30
do forestry, tree planting	131 35
do clearing land, stumping, &c	392 64
do office help	120 00
Contingencies	127 66
	10,147 32

SUMMARY.

Total Expenditure for Experimental Farms, 1892–93.

	$ cts.
Central Experimental Farm, Ottawa	20,978 65
Experimental Farm for Maritime Provinces, Nappan, N.S.	5,225 60
do Manitoba, Brandon	9,325 27
do North-west Territories, Indian Head	8,604 60
do British Columbia, Agassiz	10,147 32
General Expenses.	
Printing and stationery	2,914 24
Seed grain distribution	3,283 44
Forest tree distribution	832 02
Salaries	4,000 00
Chemical department, including salaries of chemist and assistant chemist	2,622 56
Entomological and botanical department, including salaries of entomologist and botanist and assistant	2,455 52
Office help, distribution of reports and bulletins, including salaries of accountant, director's secretary and French correspondents	3,927 55
Testing the vitality of agricultural seeds, &c	683 23
	75,000 00

WM. SAUNDERS,

Director Experimental Farms.

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